LAKE PONTCHARTRAIN, LA. AND VICINITY
LAKE PONTCHARTRAIN HIGH LEVEL PLAN

DESIGN MEMORANDUM NO. 19
GENERAL DESIGN

ORLEANS AVENUE OUTFALL CANAL

IN THREE VOLUMES
VOLUME I

US Army Corps of Engineers
New Orleans District

DEPARTMENT OF THE ARMY
NEW ORLEANS DISTRICT, CORPS OF ENGINEERS
NEW ORLEANS, LOUISIANA
AUGUST 1988

SERIAL NO. 53

DEPARTMENT OF THE ARMY
NEW ORLEANS DISTRICT, CORPS OF ENGINEERS
P.O. BOX 60267
NEW ORLEANS, LOUISIANA 70160-0267

REPLY TO
ATTENTION OF:
CELMN-ED-SP 11 August 1988

MEMORANDUM FOR: Commander, Lower Mississippi Valley Division,
ATTN: CELMV-ED-TD

SUBJECT: Lake Pontchartrain, Louisiana and Vicinity, High Level Plan, Design Memorandum No. 19 - General Design, Orleans Avenue Outfall Canal

1. The subject design memorandum is submitted for review and approval, and has been prepared generally in accordance with the provisions of ER 1110-2-1150, dated November 1984.

2. A summary of the current status of the Clean Water Act, endangered species, EIS, and cultural resources investigations is as follows:

a. There is no deposition of dredged fill material into waters of the U.S. associated with the tentatively selected plan; therefore, no Section 404(b)(1) Evaluation is required. However, if the alternative plan of parallel protection is chosen, a Section 404(b)(1) Evaluation must be prepared and an application for a Water Quality Certificate must be made.

b. Based on studies and investigations at this stage of design, the proposed action is not likely to jeopardize the continued existence of any endangered species or result in the destruction or adverse modification of the critical habitats of such species.

c. A final EIS for the barrier plan for the subject project was filed with CEQ on 17 January 1975. A final supplement to this EIS was filed with EPA on 7 December 1984. An Environmental Assessment addressing both the butterfly valve and parallel protection alternatives was mailed to the public in July 1988.

d. The project area includes an existing levee corridor on Post-1930 reclaimed land and the artificial channel of the Orleans Avenue Canal. No cultural resources are recorded in the vicinity of the proposed work.

CELMN-ED-SP
SUBJECT: Lake Pontchartrain, Louisiana and Vicinity, High Level Plan, Design Memorandum No. 19 - General Design, Orleans Avenue Outfall Canal

3. In accordance with LMVED-TS letter dated 5 February 1981, this report has been reviewed by the District Security Officer. There were no comments to be incorporated in the report.

4. This report was scheduled to be submitted to LMVD by 31 July 1988. This delay will not cause a delay in the start of construction.

5. Approval of the report and project plan as a basis for establishing the Federal cost-sharing for the parallel protection plan is recommended. Approval of local interests design plans for incorporation in the Lake Pontchartrain Louisiana and Vicinity Hurricane Protection Project as a "betterment" is also recommended.

FOR THE COMMANDER:

Encl(16 cys, fwd sep)

FREDERIC M. CHATRY
Chief, Engineering Division

LAKE PONTCHARTRAIN, LOUISIANA AND VICINITY
HIGH LEVEL PLAN
DESIGN MEMORANDUM NO. 19 - GENERAL DESIGN
ORLEANS AVENUE OUTFALL CANAL

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LAKE PONTCHARTRAIN, LOUISIANA AND VICINITY
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PROJECT AUTHORIZATION

1. Authority.

a. Public Law. Public Law 298, 89th Congress, 1st Session, approved 27 October 1965, authorized the "Lake Pontchartrain, Louisiana, and Vicinity," hurricane protection project, substantially in accordance with the recommendations of the Chief of Engineers in House Document No. 231, 89th Congress, 1st Session, except that the recommendations of the Secretary of the Army in that document shall apply with respect to the Seabrook Lock feature of the project.

b. House Document. The report of the Chief of Engineers dated 4 March 1964 printed in House Document No. 231, 89th Congress, 1st Session, submitted for transmission to Congress the report of the Board of Engineers for Rivers and Harbors, accompanied by the reports of the District and Division Engineers and the concurring report of the Mississippi River Commission for those areas under its jurisdiction. The report of the Board of Engineers for Rivers and Harbors stated: "For protection from hurricane flood levels, the reporting officers find that the most suitable plan would consist of a barrier extending generally along US Highway 90 from the easternmost levee to high ground east of the Rigolets, together with floodgates and a navigation lock in the Rigolets, and flood and navigation gates in Chef Menteur Pass; construction of a new lakeside levee in St. Charles Parish extending from the Bonnet Carre Spillway guide levee to and along the Jefferson Parish line; extension upward of the existing riprap slope protection along the Jefferson Parish levee; enlargement of the levee landward of the seawall along the 4.1 mile lakefront, and construction of a concrete-capped sheetpile wall along the levee west of the Inner Harbor Canal in New Orleans."

c. BERH Recommendation. The report of the Chief of Engineers stated: "The Board (of Engineers of Rivers and Harbors) recommends authorization for construction essentially as planned by the reporting officers...I concur in the recommendation of the Board of Engineers for Rivers and Harbors."

2, Purpose and Scope. General design of the Lake Pontchartrain High Level Plan, Orleans Parish Lakefront Levee, was presented in Design Memorandum (DM) No. 13. The plan, assumed no barriers in the Chef Menteur and Rigolets Passes, recommended the least costly method of modifying the existing lakefront levee so that a high level of protection can be achieved. DM No. 13 did not cover the lakefront protection at the junction of three Orleans Parish outfall canals.

This memorandum presents the essential data, assumptions, criteria and computations for developing project plan, design and cost estimate for protection of the Orleans Avenue Outfall Canal. The protection of the London Avenue and Metairie Relief Canals will be addressed in future design memorandums. Scope of this memorandum involves developing a project plan which cost-effectively protects the Orleans Avenue Outfall Canal from Standard Project Hurricane, SPH, as authorized under the Public Law discussed in Paragraph 1. In conjunction with hurricane protection, the plan must also provide optimum conditions for storm drainage through the outfall canal into the lake.

Hurricane Protection for the Orleans Avenue Outfall Canal can be achieved by several alternative plan concepts. One plan concept is to provide fronting protection at/or near the lakefront end of the canal. The fronting protection structure would have specialized gates or valves that could be closed during a hurricane. A description of gate requirements is detailed in a subsequent paragraph. The structure and appurtenant floodwall would tie-in to the existing lakefront levee so that once closed, a continuous line of protection would be achieved. GDM Scope design details for the fronting protection plan are contained in volume I of this three volume series. A second plan concept requires upgrading the height of the existing 2.4 miles of parallel levees along both sides of the canal. This plan concept would also require that the bridges at Robert E. Lee Boulevard, Filmore Street and Harrison Avenue be modified or floodproofed since their respective deck elevations are below the grades required to achieve project protection. Means to achieve positive closure at Pumping Station No. 7, located at the southern end of the canal must also be incorporated into this plan. Plan details for the parallel protection plan are given in Volume II. As will be demonstrated in this report, the fronting protection plan is the most cost effective way to provide hurricane protection; can be designed to fully accommodate interior drainage; and will be the least disruptive method (from the stand point of construction) to protect the developed areas behind the levees. The local sponsor, the Orleans Levee Board, OLB, as well as the Sewerage and Water Board of New Orleans, SWBNO, have gone on record in support of the parallel protection plan. It is OLB's intention to construct the major portion of the parallel protection plan in accordance with Corps of Engineers criteria so that the work can be incorporated into the federal project. The balance of the work on the parallel protection plan will be funded from the 70% contribution from the federal share of the recommended project plan. Since the recommended Federal plan and the plan which the local sponsor wishes to build, parallel protection, are not the same plan, this GDM presents both plans to GDM scope.

At the same time design details for the fronting protection were being prepared by the New Orleans District, NOD, the parallel protection plan was also being formulated to GDM scope by the Architectural Engineering firm, Design Engineering Incorporated, DEI. DEI working under contract to the Orleans Levee Board prepared the Design Memorandum contained in Volume II. Close coordination between DEI and NOD was maintained to insure that designs for the parallel protection plan satisfied Corps of Engineers design criteria and also to insure that the design could be incorporated into the federal project. The chain of correspondence between the District and DEI is also attached to the parallel protection DM to facilitate review. Not every aspect of the parallel protection plan has been fully worked out. The aforementioned correspondence stops as of April 1988 for purposes of printing this report. Two remaining areas where unresolved issues remain are on the west side of the canal from Stations 30+00 to 90+50 and north of Robert E. Lee Boulevard on the west bank of the canal, the plan presented by DEI call for construction of a new setback levee. NOD recommend an I-wall in existing levee. The few remaining issues will be resolved and results coordinated with LMVD. The estimated cost for the parallel protection plan was prepared first by confirming the quantity take-off from DEI's DM and then applying Corps of Engineers approved cost estimating procedures to the line items in the design. The procedure produces an estimated total cost for the parallel protection plan that is directly comparable to the other plans examined in this document.

3. Local Cooperation.

a. Flood Control Act of 1965 (Public Law 89-298). The conditions of local cooperation pertinent to this supplement and as specified in the report of the Board of Engineers for Rivers and Harbors and concurred by the report of the Chief of Engineers are as follows:

"...That the barrier plan for protection from hurricane floods of the shores of Lake Pontchartrain...be authorized for construction, ... Provided that prior to construction of each separable independent feature local interest furnish assurances satisfactory to the Secretary of the Army that they will, without cost to the United States:

"(1) Provide all lands, easements, and rights-of-way, including borrow and spoil disposal areas, necessary for construction of the project;

"(2) Accomplish all necessary alterations and relocations to roads, railroads, pipelines, cables, wharves, drainage structures, and other facilities made necessary by the construction works;

"(3) Hold and save the United States free from damages due to the construction works;

"(4) Bear 30 percent of the first cost, to consist of the fair market value of the items listed in subparagraphs (1) and (2) above and a cash contribution presently estimated at $14,384,000 for the barrier plan...to be paid either in a lump sum prior to initiation of construction or in installments at least annually in proportion to the Federal appropriation prior to start of pertinent work items, in accordance with construction schedules as required by the Chief of Engineers, or, as a substitute for any part of the cash contribution, accomplish in accordance with approved construction schedules items of work of equivalent value as determined by the Chief of Engineers, the final apportionment of costs to be made after actual costs and values have been determined;

"(5) For the barrier plan, provide an additional cash contribution equivalent to the estimated capitalized value of operation and maintenance of the Rigolets navigation lock and channel to be undertaken by the United States, presently estimated at $4,092,000, said amount to be paid either in a lump sum prior to initiation of construction of the barrier or in installments at least annually in proportion to the Federal appropriation for construction of the barrier;

"(6) Provide all interior drainage and pumping plants required for reclamation and development of the protected areas;

"(7) Maintain and operate all features of the works in accordance with regulations prescribed by the Secretary of the Army, including levees, floodgates, approach channels, drainage structures, drainage ditches or canals, floodwalls, seawalls, and stoplog structures, but excluding the Rigolets navigation lock and channel and the modified dual purpose Seabrook lock; and

"(8) Acquire adequate easements or other interest in land to prevent encroachment on existing ponding areas unless substitute storage capacity or equivalent pumping capacity is provided promptly, provided that construction of any of the separable independent features of the plan may be undertaken independently of the others, whenever funds for that purpose are available and the prescribed local cooperation has been provided..."

b. Water Resources Development Act of 1974 (Public Law 93-251). The local interest payment procedures outlined in the original conditions of local cooperation were modified in 1974 as follows: "The hurricane-flood protection project on Lake Pontchartrain, Louisiana, authorized by Section 204 of the Flood Control Act of 1965 (Public Law 89-298) is hereby modified to provide that non-Federal public bodies may agree to pay the unpaid balance of the cash payment due, with interest, in yearly installments. The yearly installments will be initiated when the Secretary determines that the project is complete, but in no case shall the initial installment be delayed more than ten years after the initiation of project construction. Each installment shall not be less than one twenty-fifth of the remaining unpaid balance plus interest on such balance, and the total of such installments shall be sufficient to achieve full payment, including interest, within twenty-five years of the initiation of project construction."

4. Project Document Investigations. Studies and investigations made in connection with the report on which authorization is based (House Document No. 231, 89th Congress, 1st Session) consisted of: research of information which was available from previous reports and existing projects in the area; extensive research in the history and records of hurricanes; damage and characteristics of hurricanes; extensive tidal

hydraulics investigations involving both office and model studies relating to the ecological impact of the project on Lakes Pontchartrain and Borgne; an economic survey; and survey scope design and cost studies. A public hearing was held in New Orleans on 13 March 1956 to determine the views of local interests.

5. Investigations Made Subsequent to Project Authorization. In December 1977, a Federal court injunction was issued stopping construction of portions of the authorized project. The injunction was issued on the basis that the 1975 final Environmental Impact Statement (EIS) for the Lake Pontchartrain project was inadequate. The court directed, among other things, that the EIS be rectified to include adequate development and analysis of alternatives to the then ongoing proposed action. The results of these studies are contained in a three volume report entitled "Lake Pontchartrain, Louisiana, and Vicinity Hurricane Protection Project, Reevaluation Study", dated July 1984. The reevaluation report recommended a "tentatively selected" high level plan of protection. This recommendation necessitated the preparation of the Orleans Parish Lakefront Levee West of IHNC report and this report as part of the Lake Pontchartrain Hurricane Protection Project, and the engineering and environmental studies discussed herein. Surveys and studies accomplished in preparing this GDM include the following:

a. Alternative plan studies to develop alternative methods of construction required to optimize the proposed plan of protection;

b. Aerial and hydrographic surveys;

c. Soils investigations including general and undisturbed type borings and associated laboratory investigations;

d. Detailed design studies for alternative plans (including stability analysis);

e. Tidal hydraulic studies required for establishing design grades for protective works based on the latest revised hurricane parameters furnished subsequent to project authorization by the National Weather Service;

f. Real Estate requirements;

g. Detailed cost estimates for the proposed plan of protection as well as alternative plans and necessary utility relocations;

h. Environmental effects and evaluations; and

i. A comprehensive public meeting for the "tentatively selected" high level plan held on 12 April 1984.

6. Planned Future Investigations. Upon satisfactory approval of this GDM, additional detailed Engineering Designs and Specifications will be prepared to support construction of this project feature. The recommended plan for the Orleans Avenue Outfall Canal hurricane protection is based on model testing study of the butterfly valve structure for London Outfall Canal outlet conditions. Although the principles of operation is the same, additional site specific model testing will have to be performed prior to the final design of the structure.

7. Local Cooperation Requirements. The conditions of local cooperation as specified in the authorizing laws are quoted in Paragraph 3. These conditions are applicable to the "Barrier Plan." A post authorization report for a "High Level Plan" recommended that assurances be amended. A complete list of local assurance items (as amended) are set forth as follows:

a. Provide all lands, easements, and rights-of-way, including borrow and spoil-disposal areas necessary for construction, operation, and maintenance of the project; and

b. Accomplish all necessary alterations and relocations to roads, railroads, pipelines, cables, wharves, drainage structures, and other facilities required by the construction of the project; and

c. Hold and save the United States free from damages due to the construction works; and

d. Bear 30 percent of the first cost, to consist of the fair market value of the items listed in subparagraphs (a) and (b) above and a cash contribution as presently estimated below, to be paid either in a lump sum prior to initiation of construction or in installments at least annually in proportion to the Federal appropriation prior to start of pertinent work items, in accordance with construction schedules as required by the Chief of Engineers, or, as a substitute for any part of the cash contribution, accomplish in accordance with approved construction schedules items of work of equivalent value as determined by the Chief of Engineers, the final apportionment of costs to be made after actual costs and values have been determined:

COST TO ORLEANS LEVEE DISTRICT
($1,000,000's)

	FIRST COST 1/	LOCAL SHARE
ORLEANS LEVEE DISTRICT		
Citrus New Orleans East	112.5	33.8
New Orleans	249.1	74.7
TOTAL	361.6	108.5

1/ Cost to complete after October 1979; October 1981 price levels.

e. This item has been deleted in full:

Provide an additional cash contribution equivalent to the estimated capitalized value of maintenance and operation of the Rigolets navigation lock and channel to be undertaken by the United States, presently estimated at $3,816,000, the final determination to be made after construction is complete, said amount to be paid either in a lump sum prior to initiation of construction of the barrier or in installments at least annually in proportion to the Federal appropriation for construction of the barrier, and

f. Provide all interior drainage and pumping plants required for reclamation and development of the protected areas; and

g. Maintain and operate all features of the project in accordance with regulations prescribed by the Secretary of the Army, including levees, floodgates and approach channels, drainage structures, drainage ditches or canals, floodwalls, and stoplog structures (the remainder of this item is deleted); and

h. Acquire adequate easements or other interest in land to prevent encroachment on existing ponding areas unless substitute storage capacity or equivalent pumping capacity is provided promptly; and

i. Comply with the applicable provisions of the "Uniform Relocation Assistance and Real Property Acquisition Policies Act of 1970", Public Law 91-646; and

j. Assume the responsibility to pay its share of the non-Federal project costs (the remainder of this item is deleted); and

k. As a minimum, adhere to the payment schedule of the deferred payment plan, the apportionment of costs to be made as actual costs, values, and schedules are determined. The first payment under the deferred payment plan was due on 1 October 1976, with subsequent payments being due on 1 October of each succeeding year, up to and including 1 October 1990. Interest is charged on the unpaid balance during this period at the rate of 3.225 percent per annum. Cash contributions required subsequent to 30 September 1991 shall be computed in accordance with the basic 30 percent requirement stipulated in Section 204 of the Flood Control Act of 1965, Public Law 89-298 and House Document 231,89th Congress; and

l. Recognizes that subsections (b), (c), and (e) of Section 221 of the "Flood Control Act of 1970", Public Law 91-611 shall apply to paragraph (k) above. This agreement is subject to and shall become effective upon the approval of the Secretary of the Army; and

m. Comply with Section 601 of Title VI of the Civil Rights Act of 1964, Public Law 88-352, that no person shall be excluded from participation in, denied the benefits of, or subjected to discrimination in connection with the Project on the grounds of race, creed, or national origin.

8. Status of Local Cooperation. New agreements of assurances covering all local cooperation requirements and a deferred payment plan for the Barrier Plan as authorized by Public Law 93-251 were executed by the Orleans Levee District on 30 March 1976. These assurances were accepted on behalf of the United States on 7 December 1977. Amended assurances for the High Level Plan were executed by the local sponsor on 29 May 1985, and accepted by the United States on 21 June 1985.

9. Views of Local Interests. The Orleans Levee District is the agency responsible for providing local interest assurances for this feature of the project. The plan presented herein was coordinated in detail with the Orleans Levee District engineering staff. Because OLB plans to construct the parallel protection plan it has been explained by NOD that upon higher authority approval of the Districts recommendation for fronting protection, the Federal participation will be limited to 70 percent of the first cost for fronting protection. The Levee District has indicated that they intend to construct parallel protection because even if fronting protection were built, they would be responsible for upgrading and maintaining the lateral levees. As discussed in paragraph 2, OLB plans to design and construct the parallel protection plan in accordance with Corps of Engineers design criteria so that the work can be incorporated into the Federal project. The Federal share of the cost for fronting protection will be applied to the parallel protection plan since fronting protection will not be necessary once parallel protection is in place. The intention and capability of this sponsor to provide the required non-Federal contribution for this feature have been amply demonstrated; in fact, considerable work on other completed features of the overall project has already been accomplished by this sponsor.

LOCATION OF PROJECT AND TRIBUTARY AREA

10. Project Location. The Orleans Parish Outfall canals segment of the Lake Pontchartrain, Louisiana and Vicinity Hurricane Protection Project as shown on Plate 1 is located in southeastern Louisiana on the south side of Lake Pontchartrain in Orleans Parish. There are three outfall canals which transport storm water drainage from the major urbanized areas of Orleans Parish on the east bank of the Mississippi River. The Orleans Avenue Outfall Canal lies between the other two canals, 17th Street Canal and London Avenue Canal. The three canals run parallel to each other and are oriented in the north-south direction. Plate 1 shows the location of all three outfall canals.

11. General.

The need for project work at the three outfall canals in Orleans Parish was identified subsequent to the authorization of the Lake Pontchartrain, Louisiana and Vicinity Hurricane Protection Project. The adoption of more severe hurricane parameters by the U.S. Weather Bureau necessitated upward revisions to the levee grades under that project.

The canals provide the main pumped drainage outfalls for the City of New Orleans. As can be seen on Plate 1, the pumping stations located on each of these canals are situated interior to the city some 2.5 to 3.1 miles from the shoreline of Lake Pontchartrain. Protection from tidal inundation via the lake-canal connection is presently achieved by locally constructed lateral parallel levees along each side of the canals. The existing lateral levees along each of the outfall canals do not meet the design height or design sectional stability required for the Lake Pontchartrain project under either the previously authorized Barrier Plan or the newly adjusted High Level Plan. Much of the New Orleans Area served by the Outfall Canals is well below sea level. Average topographic elevations in the drainage area are -6.0 ft. NGVD 1/ with some areas as low as -10.0 ft. NGVD. Although each of the outfall canals is similar in function and appearance, the hydrologic requirements for conveyance are quite different. This memorandum addresses the proposed hurricane plan of protection for the Orleans Avenue Outfall Canal only.

12. Orleans Avenue Outfall Canal.

The Orleans Avenue Canal extends about 2.4 miles from Pumping Station No. 7 in the vicinity of I-610 to its mouth at Lake Pontchartrain. The canal has average bottom and top widths of 100 feet and 160 feet, respectively. The average invert elevation varies from -6 ft NGVD at the pumping station to approximately -10.0 ft at Lake-shore Drive. Pumping Station No. 7, located at the south end of the canal, receives storm drainage from approximately 4,000 acres of highly urbanized drainage area and discharges into the canal through three branch pumps and three centrifugal pumps. The total existing nominal capacity of these pumps is 3,250 cfs. The Sewerage and Water Board of New Orleans expects in the future to increase the capacity to 4,550 cfs. The existing lateral parallel levees along Orleans Outfall Canal do not have sufficient elevation to protect the city from the Standard Project Hurricane (SPH).

The project plan presented in this memorandum recommends the construction of a butterfly control valve type gated structure at the lake end of the outfall canal between Robert E. Lee Blvd. and Lakeshore Drive. The structure primarily consists of four 28 ft x 16 ft gated

1/ elevations throughout this GDM are in feet referenced to National Geodetic Vertical Datum unless otherwise noted.

bays. The eccentrically pinned, vertical "butterfly" gates are designed for flow-induced operation and will automatically open or close as the direction of flow changes. No mechanical controls are required to operate the structure. As long as the direction of flow in the canal is towards the lake, gates will remain open. During hurricane event, when the lake elevation rises enough to reverse the direction of flow in the canal, the gates will automatically close. The existing levee in the vicinity of Lakeshore Drive will be raised to an elevation of 17.5 on the eastside and 18.0 on the westside to contain possible wave action during SPH. The levee will be transitioned from elevation 18.0 to 13.5 along the canal about 600 feet upstream from Lakeshore Drive.

13. Special Gate Requirements.

If fronting protection is to be the recommended Federal Plan, then the proposed structure must be designed so that it provides for maximum latitude or flexability to accommodate interior drainage. This can only be done if the gates on the structure are designed so that they can rapidly respond to the movement of water in the canal. Ideally, the gates should remain open as long as flow direction in the canal is from the pumping station to the lake. However if a condition should develop so that canal flow reverses and inflow from the lake occurs; then the gates should be equipped or specially designed to sense this condition and close. A capability to re-open when the lake stage drops below the canal stage is also an important priority for the gate system to have.

There are two separate approaches or ways that a gate system can be designed to achieve the above stated capability. A passive type of gate system using conventional gates i.e. vertical lift, sector or miter can be designed by equipping the gates with mechanical controls that are activated by a signal from gauges placed in the canal, is one way. A second design approach is to design an active type of gate system. An active gate system responds directly to the movement of water, much like the concept behind the conventional flap gated structure. In this GDM, the active gate system is called the vertically pinned butterfly valve. The butterfly valve also has a manual override which will allow the gates to be opened or closed simply by pushing a button. Volume III, contains the WES model study report on the vertically pinned butterfly valve which was conducted for the London Avenue Outfall Canal. For GDM scope designs the London Avenue model study adequately demonstrates that the valve concept is a functional alternative for the Orleans Avenue Outfall Canal. However, if the valve alternative were to be the plan ultimately constructed, instead of the parallel protection plan, a site specific model study for the Orleans Avenue Outfall Canal would be required.

It should be noted that the fronting protection plan as conceived herein would be operated so that the gates or valves would remain in their open position all of the time except when a storm approaches the Louisiana Coast. When a tropical storm or hurricane threatens, the gates would be placed in their active operational mode.

14. General.

Design Memorandum No. 13, General Design, Orleans Parish Lakefront Levee West of I.H.N.C., presents the essential data, assumptions, and computations for developing the plan design. Tidal Hydraulic criteria applicable to the High Level Plan are provided in Appendix A of DM No. 13. Volume III of DM 19 contains the model study report on the butterfly control valve structures for the London Avenue Outfall Canal and is reproduced herein to demonstrate the feasibility of the valve concept.

Construction of the proposed levee/floodwall system and/or butterfly gates will not significantly affect existing surface drainage patterns. Minor modifications to existing area storm and sanitary utilities are required.

15. Design Elevations.

A hydraulic analysis was performed for the Orleans Avenue Outfall Canal to determine the required levee/floodwall height for hurricane protection. Water surface profiles were computed by use of the Computer Program HEC-2. For flow through the bridges, HEC-2's special bridge routine was used. Most of the bridges are seated much lower than the existing levee grades. Therefore, under the given sets of boundary conditions, pressure flow or both pressure and weir flow is a common occurrence. It was assumed bridge sites would be modified to contain flow within the levee cross sections by constructing road gates at each end of the bridges to form a continuous line of protection.

Information for the bridge cross sections was taken from available as-built plans. For some bridges, however, the low cord and top of roadway elevations were estimated from the levee profile and field observations. Channel cross section data was taken from the U.S. Army Corps of Engineers survey of 1971. More recent surveys taken in 1984 were compared with the 1971 survey and little or no change was noted. Values used for Manning's "n" were as follows:

n = 0.030	main channel
n = 0.035	channel overbank

Flow rates in the canal were based on nominal pump capacities. Sewerage and Water Board Pump Station No. 7 consists of two 14 ft diameter screw pumps, one 12 ft diameter screw pump, and three centrifugal pumps. The Sewerage and Water Board has proposed additional pumps that would increase the existing nominal capacity of 3,250 cfs by 40% to 4,550 cfs.

Plates 97 through 101 show profiles of the water surface elevations for various bridge conditions with both existing and future pump capacities. A design lake elevation of 11.5 ft NGVD was used. This is the stillwater surface elevation of Lake Pontchartrain for the Standard Project Hurricane. The computed water surface elevations at the upstream side of the bridges and the respective bridge head losses are shown in Table 1. The table shows that raising the bridge decks above the water surface profile would result in stage reductions of less than 1/2 foot. From a hydraulic standpoint, the head losses due to the bridge decks is not substantial for the high lake design case.

Consideration was also given to the alternative of floodproofing the bridges over the Orleans Avenue Outfall Canal by extending the bridge deck on either side of the roadway crossing to above the anticipated water surface elevation in the canal. This modification would prevent storm water from overflowing the bridge guardrails and would keep roadway crossings open to traffic during hurricane lake conditions. Profiles 3, 4, and 5 show the water surface profiles for various floodproofing alternatives. The bridge head losses for each of these alternatives are shown in Table 1. The additional head loss due to floodproofing is small. However, floodproofing of a bridge would cause all the flow to pass beneath the bridge deck, i.e., pressure flow. This would cause bridge velocities to increase as shown in the following Table 2.

TABLE 1

Design Flowlines and Bridge Head Losses for

High Lake Level (11.5 ft NGVD)

Bridge Conditions	Canal Flow cfs	Canal Water Surface Elevations ft NGVD Lakeshore Drive	Robert E Lee Blvd	Filmore Street	Harrison Avenue	-I- 610	Drainage Pump #7
1. <u>Existing</u>	3,250	11.54	11.64	11.72	11.82	11.89	11.89
Bridge Head Loss		0.04	0.07	0.03	0.05	0.00	
	4,550	11.57	11.75	11.90	12.08	12.21	12.21
Bridge Head Loss		0.07	0.11	0.06	0.10	0.00	
2. <u>All Bridges Raised</u>	3,250	11.50	11.54	11.59	11.64	11.71	11.71
Bridge Head Loss		0.00	0.00	0.00	0.00	0.00	
	4,550	11.50	11.58	11.67	11.76	11.90	11.90
Bridge Head Loss		0.00	0.00	0.00	0.00	0.00	
3. <u>Robert E. Lee Floodproofed</u>	3,250	11.54	11.68	11.76	11.86	11.93	11.93
Bridge Head Loss		0.04	0.11	0.03	0.05	0.00	
	4,550	11.57	11.85	12.00	12.19	12.31	12.31
Bridge Head Loss		0.07	0.21	0.06	0.10	0.00	
4. <u>Robert E. Lee, Filmore & Harrison Floodproofed</u>	3,250	11.54	11.68	11.78	11.89	11.96	11.96
Bridge Head Loss		0.11	0.11	0.05	0.07	0.00	
	4,550	11.57	11.85	12.04	12.26	12.38	12.38
Bridge Head Loss		0.07	0.21	0.10	0.14	0.00	
5. <u>All Bridges Floodproofed</u>	3,250	11.54	11.69	11.78	11.90	11.97	
Bridge Head Loss		0.04	0.11	0.05	0.07	0.00	
	4,550	11.58	11.87	12.06	12.28	12.40	12.40
Bridge Head Loss		0.08	0.21	0.10	0.14	0.00	

TABLE 2

BRIDGE VELOCITY (Ft./Sec.)

Bridge	Present Pump Capacity		Future Pump Capacity	
	non-floodproofed	floodproofed	non-floodproofed	floodproofed
Lakeshore Drive	1.5	1.6	2.0	2.2
Robert E. Lee Blvd.	1.9	2.4	2.6	3.3
Filmore Avenue	1.6	1.8	2.1	2.5
Harrison Avenue	1.9	2.0	2.5	2.8

The increase in channel velocities due to floodproofing is not substantial and the values are within acceptable limits. Also, the inundation caused by floodproofing would reduce the effective weight of the bridge by about 0.6 of its weight in air and any air entrapped under the deck would further reduce the effective weight. The horizontal forces due to the unbalanced hydrostatic pressure, plus the energy from the moving mass of water would increase the dynamic forces acting on the bridge deck. The likelihood of the structure being lifted or pushed off the abutments and piers is greatly increased. Therefore, any bridge being floodproofed would have to be anchored to prevent this.

16. Structure Analysis.

The U.S. Army Engineers Waterways Experiment Station (WES) conducted a hydraulic model study on the use of butterfly gates on the London Avenue Outfall Canal. The purpose of the study was to evaluate the proposed location for the structure and develop a gate and canal design that would permit automatic flow-induced opening or closing of the gates when subjected respectively to pumped flows or hurricane surges. Tests were also conducted to evaluate the torque acting on vertical gate shafts when subjected to various flows, wave conditions and gate openings.

The model tests for the head losses across the structure showed that these losses were small and considered insignificant for hydraulic analysis. A copy of the hydraulic model study is attached as Volume III.

GEOLOGY

17. General.

a. Scope. The geology presented herein is based on regional and local surface and subsurface information. It is intended to present a general project overview of the pertinent geologic data and interpretation.

b. Physiography and Topography. The project site is located within the Central Gulf Coastal Plain region on the flanks of the Mississippi River Deltaic Plain and normal to the Lake Pontchartrain shoreline in northern Orleans Parish. Pronounced physiographic features of the area are lakes, shorelines, canals, an abandoned Mississippi River delta, the Mississippi River, beach ridges, marshes, and swamps. Ground surface elevations in the vicinity vary from approximately -10.0 feet NGVD to +20.0 feet NGVD along the crown of the mainline Mississippi River levees.

c. Surface Investigation. Aerial photographs, topographic maps, and geologic maps were used in conjunction with published literature to define the geologic setting of the project area.

d. Subsurface Investigation. Four 1-7/8 inch I.D. general type borings and twelve 5-inch undisturbed borings were drilled, sampled, and classified by Corps of Engineers personnel for this project. In addition, a total of four 5-inch borings were drilled and sampled by an A-E contractor and classified by Corps of Engineer personnel. An additional 52 A-E contract borings were reviewed for geologic analysis. Twelve Corps of Engineer borings, all 4 of the joint venture borings, and the fifty two A-E contract borings are presented on the geologic profiles (Plates 13 through 19) in order that the most geologically complete interpretation is rendered. The A-E contract boring symbols were modified to accommodate the Unified Soil Classification System. Individual boring depths varied from 28.5 feet to 123.0 feet and generally encountered artificial fill, Holocene soils, and the Pleistocene horizon. The boring data, used in conjunction with other available data, was the primary source for site specific geologic foundation interpretations. (Refer to Table 3 for Corps of Engineer and Table 4 for A-E contract boring summary).

e. Geophysical Investigation. No geophysical methods were used at the project site. Present refractive methods would not have delineated the various Holocene environments.

18. Regional Geology.

a. Geologic Structure. The project site is located within the Gulf Coastal Plain province. The province extends east to west from Georgia to Texas and north to south from southern Illinois to the Gulf of Mexico continental shelf. The central portion of the province is

TABLE 3

CORPS OF ENGINEERS BORINGS

BORING NO.	STA.	OFFSET	ELEV.	DEPTH SAMPLED	DATE COMPLETED
1-OUW	2+13	PS TOE W.LEV.	1.9	28.5	22 OCT 70
2-OUE	2+70	PS TOE E.LEV.	-0.3	79.5	16 OCT 70
8-OUG**	18+48	C/L W.LEV.	5.8	40.0	23 OCT 70
4-OUE	40+53	PS TOE E.LEV.	0.9	74.5	14 OCT 70
3-OUW	40+53	C/L W.LEV.	6.9	45.0	26 OCT 70
7-OUG**	61+96	C/L E.LEV.	9.4	50.0	22 OCT 85
5-OUE	81+53	PS TOE E.LEV.	-1.0	75.5	19 OCT 70
6-OUG**	87+63	PS TOE E.LEV	-1.5	40.0	21 OCT 85
5-OUG**	87+63	C/L E.LEV.	9.2	50.0	22 OCT 85
2-OG*	101+75	C/L CANAL	-5.5	107.5	24 JUL 84
4-OUG	103+75	C/L CANAL	-5.9	123.0	20 JUL 84
1-OG*	105+75	C/L CANAL	5.3	108.0	12 JUL 84
3-OUG	111+87	50'PS TOE W.LEV.	4.4	83.0	24 MAY 84
2-OUG	116+55	50'PS TOE E.LEV.	3.7	82.5	15 MAY 84
1-OUG	116+55	C/L E.LEV.	9.0	82.5	16 MAY 84
6-OUW	119+57	25'PS TOE W.LEV.	4.6	75.0	20 OCT 70
2-OP*	123+87	250'PS TOE W.LEV.	4.5	100.0	15 MAR 73
1-OP*	124+25	PS TOE E.LEV.	3.1	100.0	15 MAR 73
1-UOP	124+37	25'PS TOE W.LEV.	2.8	102.5	28 MAR 73
5-ULO	128+50	C/L E.LEV.	12.4	102.5	24 MAY 72

* 1-7/8" WIRELINE SAMPLES

** SAMPLED BY A-E CONTRACTOR AND CLASSIFIED BY CORPS OF ENGINEERS

TABLE 4

A-E CONTRACT BORINGS

BORING NO.	STA.	OFFSET	ELEV.	DEPTH SAMPLED	DATE COMPLETED
1	4+13	17' SW	9.94	100.0	17 SEPT 85
2	4+36	23' L	-1.70	50.0	21 SEPT 85
3	8+61	5' L	10.04	50.0	3 SEPT 85
4	9+00	23' L	-1.54	50.0	19 SEPT 85
5	14+26	4' L	9.88	50.0	16 SEPT 85
6	14+17	4' R	5.60	50.0	21 SEPT 85
7	18+22	5' L	9.98	50.0	31 AUG 85
8	18+67	24.5'L	-1.17	50.0	19 SEPT 85
9	24+57	4.5'L	9.83	50.0	16 SEPT 85
10	24+94	2' R	5.73	50.0	21 SEPT 85
11	27+97	4' L	9.83	50.0	31 AUG 85
12	28+38	24' L	-1.27	50.0	19 SEPT 85
13	31+80	2' L	9.83	50.0	9 SEPT 85
14	31+68	28' L	-3.30	50.0	20 SEPT 85
15	37+54	2' L	9.81	50.0	31 AUG 85
16	37+58	24.5'L	-1.24	100.0	20 SEPT 85
17	41+65	2' L	9.81	50.0	16 SEPT 85
18	41+40	23' L	-1.60	50.0	20 SEPT 85
19	47+40	1.5'L	10.01	50.0	28 AUG 85
20	47+31	25' L	-1.87	60.0	20 SEPT 85
21	53+20	0.5'L	9.71	50.0	16 SEPT 85
22	51+80	25' L	-4.41	50.0	20 SEPT 85
23	57+97	1' R	9.56	50.0	27 SEPT 85
24	58+44	25' L	-4.27	50.0	21 SEPT 85
25	62+88	1.5'R	9.61	100.0	12 SEPT 85
26	62+73	25' L	-4.27	50.0	20 SEPT 85
27	64+27	5' R	9.06	50.0	31 AUG 85
28	67+33	25' L	-5.48	50.0	19 SEPT 85
29	72+40	5' R	9.81	50.0	27 AUG 85
30	72+22	25' L	-5.29	50.0	19 SEPT 85
31	77+27	5.5'R	9.71	50.0	31 AUG 85
32	77+24	25' L	-6.21	50.0	19 SEPT 85
33	82+90	6' R	9.26	50.0	2 AUG 85
34	83+01	3.5'L	4.70	50.0	17 SEPT 85
35	87+34	4.5'R	9.16	50.0	31 AUG 85
36	87+26	25' L	-5.20	50.0	18 SEPT 85
37	93+97	1.5'L	9.04	50.0	1 AUG 85
38	93+67	C/L	8.89	100.0	6 SEPT 85
39	98+52	11' R	9.14	50.0	1 AUG 85
40	98+08	1.5'R	9.69	50.0	5 SEPT 85
41	103+37	C/L	9.22	50.0	31 AUG 85
42	103+37	C/L	9.49	50.0	5 SEPT 85
43	107+69	3' L	9.42	50.0	31 JULY 85
44	106+80	C/L	9.90	50.0	12 SEPT 85
45	113+33	C/L	9.67	50.0	31 AUG 85

TABLE 4

A-E CONTRACT BORINGS
(CONT.)

BORING NO.	STA.	OFFSET	ELEV.	DEPTH SAMPLED	DATE COMPLETED
46	114+05	8' R	9.45	50.0	4 SEPT 85
47	118+76	2' R	9.19	50.0	31 JULY 85
48	117+92	C/L	9.65	50.0	6 SEPT 85
49	123+77	C/L	10.39	50.0	31 AUG 85
50	123+03	C/L	10.09	50.0	4 SEPT 85
51	128+82	1.5'L	12.89	50.0	30 JULY 85
52	128+20	4' R	8.59	50.0	6 SEPT 85

known as the Mississippi Embayment. The embayment is structurally oriented in a north-south direction with its axis passing locally through a point east of Houma, Louisiana.

The development of the embayment, an approximate 60 million year process, is continuous with the influx of additional sediment. Tertiary and Quaternary sediment thicknesses presently exceed 40,000 feet near the gulf coastline. This tremendous accumulation of sediments has caused a downwarping of the underlying basement rock resulting in the deformation and faulting of that sediment. Such massive accumulations are also associated with higher than normal Quaternary sediment consolidations and stresses that also produces both regional and local faults and structural deformations. Salt domes, diapiric formations of deeply seated Triassic-Jurassic evaporitic deposits, have also produced a locally faulted and massively deformed subsurface. These surficial extrusions or near surficial intrusions usually result in large easily mined halite and gypsum deposits. Diapiric movement appears to be pre-Quaternary in age.

b. <u>Faulting</u>. A series of subsurface normal faults trending NE to SW and NW to SE are common in the area, but lack surface expression in the immediate project area. Most of these faults, classic down to the basin normal faults, are associated with the structural deformation of the sedimentary deposits, resulting from differential settlement of the subsiding sediments. Local faulting is somewhat responsible for the north shoreline orientation of Lake Pontchartrain. As previously stated, diapiric salt movement has caused local, generally radial type normal faulting.

c. <u>General Historical Geology and Geomorphology</u>. The Holocene geologic history of the project area is directly related to the developing Mississippi River. The Mississippi River was formed during the Nebraskan stage, the first glacial advance of the Pleistocene Epoch. Sea level at that time was approximately 450 feet below present level due to the massive continental accumulations of ice. Subsequent to this first glacial period, three other major cycles of continental glacial advancement and recession occurred. These advances (waxing glaciation) and retreats (waning glaciation) have respectively resulted in periods of Mississippi River degradation (erosion or stream entrenchment) and aggradation (sediment deposition or channel filling).

During the last glacial cycle (Wisconsin), the lower Mississippi Embayment experienced a major Mississippi River entrenchment and stratigraphic incision of older Pleistocene and Tertiary deposits. The axis of this ancestral trench runs southeast to northwest between Baton Rouge and Lafayette and southward through a point near Houma, Louisiana. This orientation and location approximates the present central portion of the alluvial valley. During this period, the various tributaries of the Mississippi River also experienced entrenchment.

As glacial meltwaters returned to the oceanic basins, sea level rose and eventually stream gradients decreased. Decreased Mississippi River gradients and associated energy losses resulted in a massive coarse grained alluviation of the entrenched valley. A braided river system resulted from these factors. Continued deposition of coarse grained material within the valley directly above the incised and formerly exposed Pleistocene surface resulted in a massive coarse grain blanket that is now referred to as the Holocene Substratum.

As stream gradients stabilized, grain size and sediment load decreased to such an extent that a single meandering channel, forerunner of the modern Mississippi, formed and the braiding characteristic ceased. A topstratum comprised of the finer grain size sediment and representing the various deltaic and fluvial environments developed within the Mississippi River floodplain.

Lateral and southern deltaic progradation resulted from a meandering Mississippi River. As a result of continued meandering, channel shifts, and massive deposition, a series of seven delta lobes were built gulfward. The seven major courses and associated delta lobes are presently identifiable in the region. The oldest course that can be detected is the Sale'-Cypremort (Maringouin), which is located along the present western boundary of the Mississippi River Deltaic Plain. The Sale'-Cypremort was active approximately 5,500 to 4,400 years before present. Concurrent with the abandonment of that course, the Mississippi River shifted eastward and occupied the Cocodrie course. It was during this period, approximately 4,600-3,500 years before present, that the first Holocene sediments of any significance were introduced into the study area. However, when the Mississippi River again shifted, this time to the west to occupy the Teche course (3,800 to 2,700 years before present), most of the residual Cocodrie Delta began to subside and was eventually destroyed by advancing gulf waters. Continuing to seek a shorter route to the gulf because of decreased channel gradient, the Mississippi River again shifted eastward to occupy the St. Bernard course. It was during this period, 2,800 to 1,700 years before present, that maximum Holocene deposition occurred in the study area, Lake Pontchartrain was encapsulated in its present form, and major physiographic features of the New Orleans area were developed. The Mississippi River, shifting briefly to the west once again, occupied the Lafourche course from 1,900 to 1,300 years before present, and then finally shifted eastward to occupy the Plaquemine course (1,200 to 450 years before present) and the Balize or Modern course (450 years before present). (Refer to Figure 1, Deltaic Plain of the Mississippi River).

At present, the Mississippi River is discharging most of its sediments near or at the edge of the continental shelf and into deep gulfwaters. Thus, dissipation of sediment occurs over a relatively large geographical area. Construction of flood protection levees and major flood control projects restrains the river from migrating laterally and prevents the previously occurring annual flooding and associated sediment replenishment of the southeastern Louisiana floodplain.

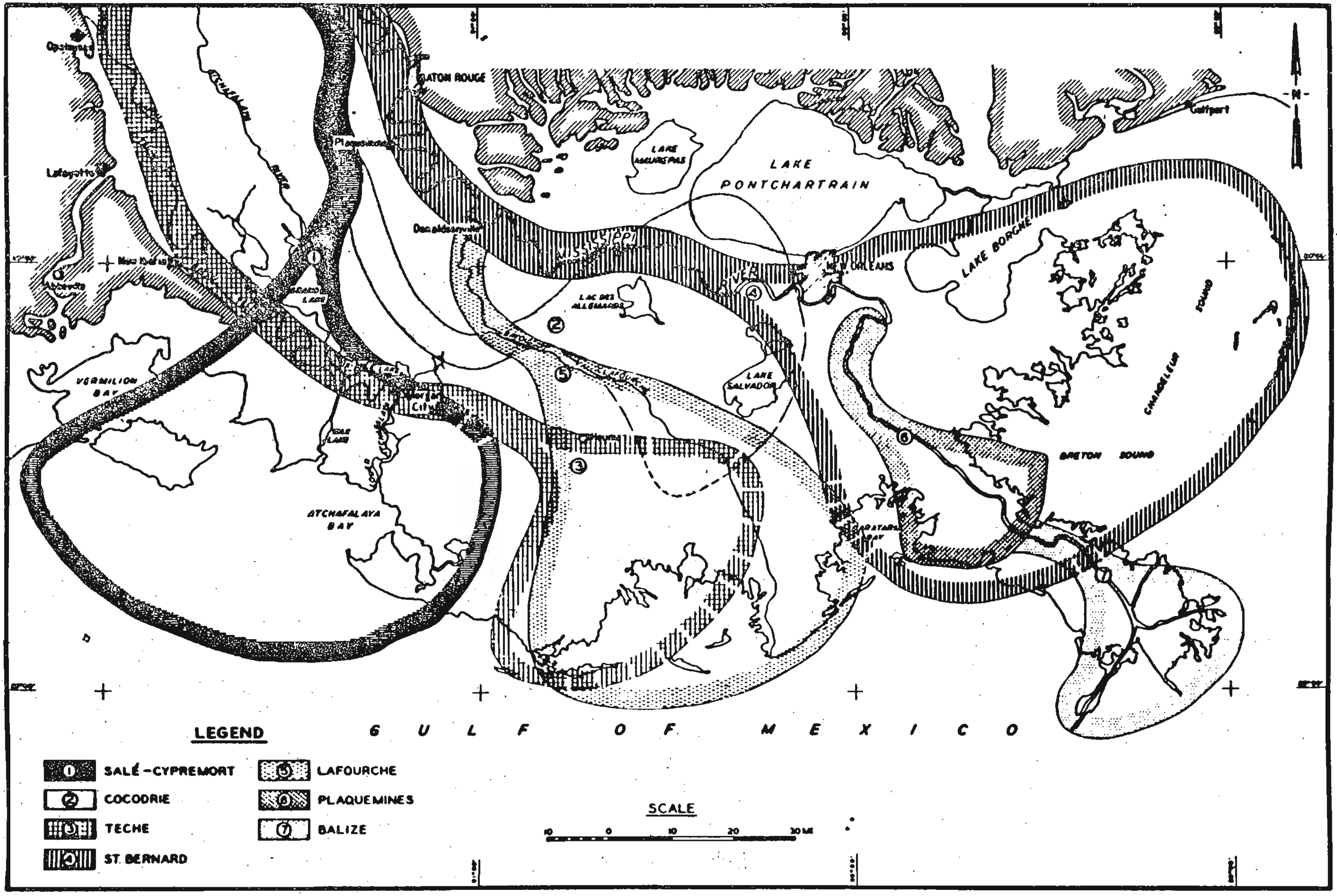


Figure 1 Mississippi River deltas (From Kolb, et al, 1958)

When course abandonment occurs, deltaic accretion and sedimentation ceases. These processes are then replaced by the effects of subsidence and coastal erosion. This destructive phase is characterized by a series of environmental changes that includes landform deformation and shoreline retreat.

d. Regional Subsidence and Land Loss. The project area lies in a region of active subsidence. Estimated project site rates vary from 0.33 to 0.49 foot per century (McFarlan, 1961 and Frazier, 1967). Regional subsidence rates vary from less than 0.5 foot to greater than 5.0 feet per century. Rates of 5.00 or more feet per century are found in the active delta to the south. The high subsidence and land loss rates result from five major processes. They are:

(1) Tectonic
- (a) Sea level rise
- (b) Basement sinking
- (c) Faulting

(2) Consolidation or sediment compaction

(3) Human influences
- (a) Water and hydrocarbon withdrawal
- (b) Commercial activities
- (c) Construction

(4) Vegetative modifications

(5) Erosion

Subsidence within the deltaic plain is a natural process and is expected to continue. The effects may be mitigated by controlled sediment replenishment within marsh environments and areas of prior marsh existence by such methods as breached levees, strategically placed drainage structures, and pumping stations.

Former studies indicate that the Pontchartrain Basin is experiencing serious shoreline retreat and land loss. Estimated shoreline retreat is 2 feet per year within Lake Maurepas and 5.4 feet per year within Lake Pontchartrain. Pontchartrain Basin calculations indicate land losses of 50 to 100 acres per year. However, site conditions indicate little, if any, erosion.

e. Earthquake History. The region is located in a stable area of low seismicity. The Mississippi River Deltaic Plain is encompassed by "Zone 1" on the Seismic Zone Map of the United States (Figure 2). This indicates that earthquake activity is a relatively rare event and usually less severe than average. Resulting damage to structures or levees in the immediate area can be expected to be minimal.

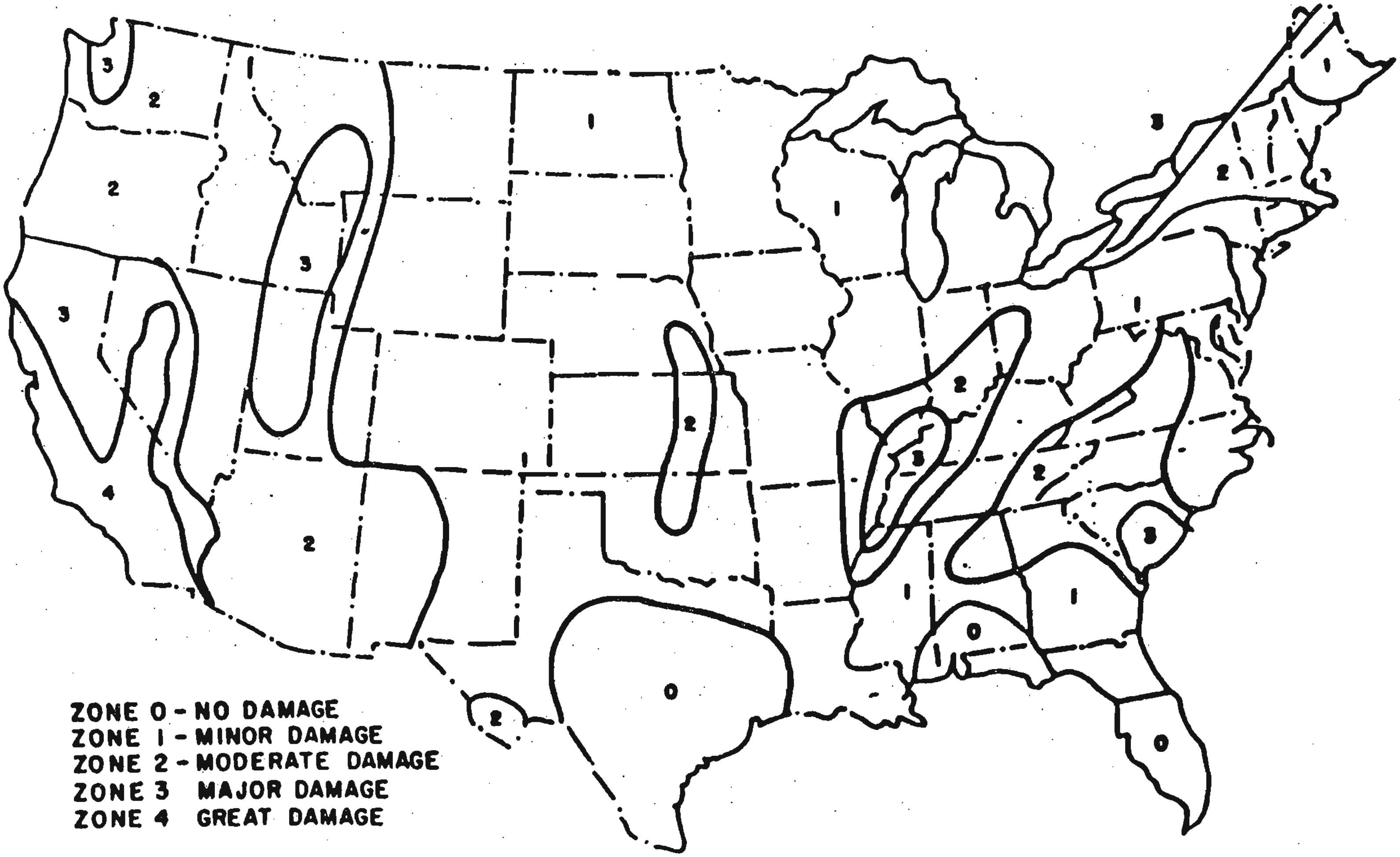


FIG. 2 Seismic Zone Map of the United States

The only events that are known to have produced motion in the region were a series of New Madrid, Missouri earthquakes dated 1811 to 1812. These earthquakes were felt in the New Orleans area. However, no direct report or geologic evidence suggests that the zone of damage extended to the study site. A few minor quakes, having occurred in south Louisiana and southwest Texas, may have transmitted vibrations to the area. Calculated ground accelerations show that the greatest ground motions would likely occur from a major earthquake in the New Madrid Zone of the northern Mississippi Embayment. However, none of the calculated motions would exceed 0.05 g.

f. Groundwater. The shallow aquifers of the New Orleans area consist of discontinuous near-surface sands, such as former and present Mississippi River accretionary and distributary-channel deposits. These sands, because of quality and quantity constraints, are of little importance as aquifers. Where present, they are capable of supplying only small quantities of water (less than 50 gal/min).

Four deep freshwater aquifers in close proximity to the project area are: the Gramercy (historically referred to as the 200-foot sand), Norco (400-foot sand), Gonzales-New Orleans (700-foot sand), and the "1,200-foot" sand. The Gonzales-New Orleans aquifer, as determined by the Louisiana Geological Survey, is a good source of potable water within the New Orleans area and is presently being used in various cooling systems in the New Orleans metropolitan area. Stratigraphically equivalent sands upriver from New Orleans are without similar nomenclature and are historically referred to simply as older deltaic or pre-Holocene deposits. The project effect on the water quality or volume per local aquifer will be minimal.

g. Mineral Resources. Several hydrocarbon reservoirs are located in the region; however, none are presently in close proximity to the project area.

Any future levee construction will not preclude future oil and gas production or exploration, since directional drilling methods can be utilized.

Shell dredging within the confines of Lake Pontchartrain would not be affected unless borrow material is produced within the confines of the lake. Constraints on shell dredging may be enacted to prevent any activity near such a borrow site. Measures may then become necessary to mitigate possible loss of resource at this site.

No other major mineral resources are presently being developed in the area.

19. Site Geology.

a. Site Location and Description. The project is confined to northern Orleans Parish and that portion of the levee that parallels the Orleans Outfall Canal. This represents approximately 5 miles of levee improvement. The project alignment is nearly normal to the regional geologic strike and traverses hydraulic fill, Holocene surficial marsh and subsurface beach, lacustrine, and marine deposits. A review of geologic profiles A-A' through D-D' (Plates 14 and 15) details geologic structure parallel to levee centerline. Profile AA-A'A' (Plate 17) details site conditions parallel to canal centerline and in the area of the proposed valve structure. Profile BB-B'B' and CC-C'C' (Plates 18 and 19) details geologic structure parallel to the valve structure axis. Subsurface elevations at the top of Pleistocene average -65 feet, but vary from approximately -40 to -85 feet.

Historically, the site stratigraphic sequence indicates a period of aerially exposed Pleistocene prior to an early Holocene marine transgression. Evidence of a gulfwater transgression and the subsequent development of the Pontchartrain Basin is present as a locally extensive basal bay-sound deposit. The clayey bay-sound deposit averages 20 feet in thickness and provides parenting material for the overlying Pine Island Beach trend. Estimated ages of the beach and bay-sound deposits are respectively 5,000 and 7,000 years.

Isolation of the embayment by the eastward prograding Cocodrie Delta (4,600 to 3,500 years before present) marked the end of marine conditions and the subsequent development of the lacustrine (lake) environment that exists today at the northern end of the project. Cocodrie aged deposits appear to be absent or obscured in the immediate area. This is possibly a result of two factors: (1) the deltaic material was eroded after abandonment and (2) the remaining material closely resembles the overlying lacustrine and further testing would be necessary to differentiate.

The later prograding St. Bernard Delta, 2,800-1,700 years ago, represented the last major period of active deltaic sedimentation within the area. The surficial marsh deposit genesis occurred during this period of time. A further description of the marsh is forthcoming. West of the project, marsh type deposits are found within the confines of Lake Pontchartrain. This may be further evidence of an expanding lake resulting from shoreline retreat.

The surficial marsh veneer, 5 to 15 feet thick throughout the project, represents the last stage of sedimentation in the area. Marsh type sediments are a result of annual Mississippi River overbank flooding and subsequent deposition of clay and silt size particles landward of the natural levees.

A review of borings in the vicinity of the artificial levee indicates that the additional overburden acts as a surcharge, in some instances consolidating the underlying marsh deposit to less than half the original thickness. Along the centerline of the artificial levee, the additional loading of soil has, to a lesser extent, similarly affected the underlying lacustrine.

Borings north of Robert E. Lee Blvd. reveal a massive surficial 10 to 20 feet thick blanket of hydraulic fill. This fill was placed behind the seawall during the later portion of the 1920's and the early 1930's. The fill is an excellent base for founding structures.

Borings within the confines of the lake reveal a slightly elevated Pleistocene surface and Holocene stratigraphic thinning. This may be indicative of one or a combination of the following: southern stratigraphic dip, deltaic loading, lower subsidence rates, and/or possible normal faulting. Lake Pontchartrain bay-sound deposits are thinner than the onshore equivalent.

b. Detailed Holocene Environmental Descriptions.

1. Bay-sound deposits are fine to coarse grain sediments bottoming bays and sounds. Average thicknesses are 20 feet in the project area. Reworking of the bottom portion by burrowing marine organisms produces a mottled appearance and inclusions of materials that are distinct from the surrounding sediment. Colors are typically light gray to gray.

2. Beach deposits are typically fine sands with large quantities of shells and shell fragments. The sands, generally well sorted with few clay lenses, are well suited for founding projects. Subsidence due to soil compaction is relatively minimal. The wedge shaped beach deposit, found throughout the project, thins from a 40 feet thickness at the southern end of the project to 10 feet near Lake Pontchartrain. The base elevation of the deposit remains a relatively constant -45 feet NGVD. This deposit is the remnant Pine Island Beach trend. The beach trend developed as sand was transported westerly from an area near Slidell.

3. Area lacustrine deposits are generally fine grained, thinly stratified, and average 10 feet in thickness. These characteristics are indicative of periodic deposition within a quiescent environment. Organic remains are more prominent in the upper 5 feet. The bottom one-third is characterized by relatively massive clays and an absence of organics.

4. The marsh deposits are highly compressible organic soils that typically cover 95 percent of the area. They grade vertically downward from peat to organic clays and silts. Generally, soil moistures exceed 100 percent, color varies from light grey to black, and consistences vary from very soft to medium.

c. Detailed Pleistocene soil descriptions. The Pleistocene soils are a result of both deltaic and marine deposition. They represent both the regressive and transgressive phases and associated environments of an earlier Mississippi River deltaic system. The soils are therefore similar to the overlying Holocene. However, due to dessication, Pleistocene deposits are distinguished by a decrease in moisture contents, a stiffening of consistences, a decrease in sampling penetration rates, an increase in oxidized sediments, and the presence of calcareous concretions.

d. Foundation Conditions. Representative geologic site conditions are displayed on cross sections A-A' through D-D' (Plates 13 through 19). The massive beach deposit has greatly influenced the stratigraphic geometry of the area. The wedge-shaped subsurface beach has prevented an accumulation of deltaic type deposits at the southern end of the project; thus, this area is well suited for project improvement. However, as the beach thins northward toward Robert E. Lee Blvd., the foundation stability suffers due to a thickening surficial marsh and the development of the underlying clayey lacustrine deposit. The area north of Robert E. Lee Blvd. is relatively stable due to a general absence of marsh deposits and the placement of hydraulic fill. Potential for additional differential settlement, structural uplift, or need of construction dewatering and its effect on foundation conditions must be addressed.

e. Future Investigations. Subsurface field investigations have been completed, and only occasional future investigations are anticipated if it becomes necessary to verify anomalous subsurface conditions.

20. Conclusion.

Current geologic information indicates generally favorable foundation conditions with regard to future construction. Further addition of fill may result in increased settlement rates, due to lacustrine and marsh soil compaction. Differential settlement may result in areas where organic contents are extremely high and relatively thick. Should future construction in the immediate project vicinity require dewatering, local settlement may occur due to oxidation of organics and consolidation of sediment.

FOUNDATION INVESTIGATION AND DESIGN

21. General. This section includes the soils investigations and foundation design for both the valve structure plan and the parallel protection plan. Both plans consist of I-walls, levees, and pile supported structures.

22. Field Exploration. A total of 16 undisturbed 5 inch diameter soil borings was made in the project area. Borings 1-OUW, 2-OUE, 8-OUG, 4-OUE, 3-OUW, 7-OUG, 5-OUE, 5-OUG, and 6-OUG were made at the levee C/L or protected side levee toe for the parallel protection plan below Robert E. Lee Blvd. Borings 1-OUG, 2-OUG, 3-OUG, 1-UOP, 5-ULO, and 6-OUW were made above Robert E. Lee Blvd. for the parallel protection plan and valve structure plan. Boring 4-OUG was made in the C/L of the existing canal for the valve structure plan. The individual logs of these 16 undisturbed borings are shown on Plate 20 through 35. A total of 4 general type borings (1-OG, 2-OG, 1-OP, and 2-OP) were taken using a 1 7/8 inch ID core barrel or a 1 3/8 inch split spoon sampler. Borings 1-OG and 2-OG were made in the C/L of the existing canal. The locations of the undisturbed and general type borings are shown on Plate 12A. The boring logs are shown on Plates 36 through 38. Fifty two borings taken by A-E's for the Orleans Levee Board were used in conjunction with the COE borings in the foundation design. Twenty six of the borings were made with a 5 inch diameter Shelby Tube sampling barrel and twenty six of the borings were made with a 3 inch diameter Shelby Tube sampling barrel. The locations of borings taken by the A-E are shown in Figure 1 of Appendix A, Volume II. The boring logs are also contained in Appendix A of Volume II.

23. Laboratory Tests.

a. COE. All samples obtained from the borings were visually classified. Water content determinations were made on all cohesive soil samples. Unconfined Compression (UC) Shear Tests, Atterberg and grain size analyses were made on selected samples of cohesive and granular soils, respectively. Water content determinations, (UC) test results and the D_{10} determined from grain size analyses are shown adjacent to the logs on the boring profiles presented on Plates 20 through 35. Unconsolidated-Undrained (Q), Consolidated-Undrained (R), and Consolidated Drained (S) Shear Tests and Consolidation (C) Tests were made on representative soil samples obtained from the undisturbed borings. Liquid and plastic limits were obtained on the undisturbed cohesive test specimens. These tests are summarized on the boring logs shown on Plates 20 thru 35. The individual shear strength data sheets are shown in Appendix B.

b. A-E. Laboratory tests consisting of natural water content, unit weight, and either Unconfined Compression (UC), Unconsolidated Undrained (Q), one point or three point Shear Tests were performed by

A-E's on samples obtained from the A-E borings. Liquid and plastic limit tests were made on selected samples. Laboratory test results are shown in Appendix A, Volume II. (UC) tests, one point and three point (Q) tests in silts and sands were not plotted on the design shear strength profiles.

c. Design shear strength parameters are shown on Plates 39 and 40.

24. Design Problems. The principal problems to be resolved were as follows:

a. Structural excavation slopes, cantilever and braced sheetpile.

b. Dewatering and hydrostatic pressure relief required to construct the structure in the dry.

c. The stabilities of the final slopes of the closure levees and approach levees.

d. Bearing pile lengths and subgrade reaction data for the valve structure, T-walls, and floodgates.

e. Underseepage for the valve structure, pervious fill levees north of Robert E. Lee Blvd., T-walls and buried beach sand underlying the south end of the project.

f. Limited R/W along the canal. On the east side of the canal, the R/W is limited by parks. On the west side of the canal above Robert E. Lee Blvd., the R/W is limited by buildings and park land. Below Robert E. Lee Blvd., the west levee toe had been degraded and replaced by a soil supported, reinforced concrete retaining wall and Orleans Avenue in 1965. The wall retains as much as 6 feet of earth fill.

g. Deep seated analyses and construction sequence of the T-walls.

25. Lateral Earth Pressure. Backfill adjacent to the structure on the west side will consist of a sand wedge to relieve lateral earth pressure. At rest coefficients (k_o) of the backfill materials were used to determine the lateral earth pressure against the structure. For sand backfill, a lateral earth pressure coefficient of 0.5 was used for design. For clay backfill, a lateral earth pressure coefficient of 0.8 was used for design. At the east side of the structure, a shell closure with an at rest Coefficient of 0.4 was used for design. Total unit weights were used above water, and submerged unit weights below the water. The lateral earth pressure diagrams for the construction, operating, and dewatering cases are shown in cross sections on Plate 66.

26. Construction Dewatering and Hydrostatic Pressure Relief. To build the structure in the dry and insure stability of the structure excavation during construction, hydrostatic pressure relief will be provided in the pervious layers beneath the structure excavation area. Temporary piezometers will be installed in the pervious layers to monitor the pressure during dewatering and pressure relief period. The method of lowering the groundwater is to be left to the construction contractor with performance specifications being prepared on an "end-result" basis. The specifications will allow the use of wells, sumps, pumps, etc., as well as wellpoints. The dewatering system presented on Plate 67 is for cost estimating purposes and for use in evaluating the adequacy of the contractor's proposed hydrostatic pressure relief system.

27. Underseepage and Hydrostatic Pressure Relief.

a. Underseepage.

1. Valve Structure. A steel sheet pile cutoff will be used beneath the structure to provide protection against hazardous seepage. The location and penetration depth of the sheet pile cutoff wall are shown on Plate 6. Analyses were performed by Lane's Weighted Creep Ratio Method. The weighted creep distance was calculated as the sum of the vertical creep path distance plus one-third the horizontal creep distance. Lane's weighted creep ratio is the ratio of the weighted creep distance to the maximum differential head. The calculations are presented in Appendix B. The sheet pile cutoff of El. -25.0 NGVD under the structure, was extended into the west levee closure as recommended by EM 1110-2-1913. For the east levee closure, the sheet pile tip penetration from the I-wall stability analysis was extended to El. -25.0 NGVD due to the shell embankment section. Analyses were performed by Harr's Method.

2. B/L Sta. 90+50 to the Lakefront Levee Eastside. The sheet pile tip penetrations from the I-wall stability analysis were extended due to the silt and sand layers shown in the levee embankment sections. Analyses were performed by Flow Net.

3. B/L Sta. 29+40 to B/L Sta. 90+50 Westside. The tip penetration of the sheet pile cutoff wall beneath the T-walls were computed using Harr's Method. Analyses are shown in Appendix B.

4. B/L Sta. 2+44 to B/L Sta. 29+40 Westside. The tip penetration of the I-wall stability analysis checked. The analysis utilized Harr's Method and is shown in Appendix B.

b. Hydrostatic Pressure Relief.

1. B/L Sta. 90+50 to Lakefront Levee. Six piezometers were installed by the Orleans Levee Board's A-E in 1985 at the locations and

elevations shown in Table 5. Three of the piezometers are located at approximately Sta. 113+80. The piezometer readings are shown in Apppendix B. The gage and piezometric readings indicate that the pervious strata are connected to the Orleans Avenue Outfall Canal. A gradient was determined from the piezometric readings and used to compute a piezometric headline for a S.W.L. of 11.6 NGVD. The design piezometric headline was used in the stability analysis and uplift analysis. The stability analyses and uplift analyses indicated that a hydrostatic pressure relief system would not be required.

2. B/L Sta. 0+00 to B/L Sta. 50+00. The buried beach sand is highest between B/L Sta. 0+00 to B/L Sta. 50+00. The A-E installed three piezometers at approximately B/L Sta. 18+10. The piezometer readings are shown in Appendix B. The piezometer readings do not indicate that the buried beach sand is connected to the Orleans Avenue Outfall Canal. The piezometer readings indicate that the gradient slopes upward away from the canal, which may indicate a source in the lagoons or subsurface drainage system of City Park. Piezometers installed by the COE in 1970 and subsequent readings in 1971 also indicate that the buried beach sand is not connected to the Orleans Avenue Outfall Canal. The piezometers on the west side of the canal show that the hydraulic gradient from the east side continues to drop on the west side of the canal. The COE piezometers have become inoperative due to vandalism. Gage readings, piezometer readings, and locations are shown in Appendix B. A small test section in the 17th Street Outfall Canal was dredged to expose the buried beach sand to the canal. Piezometers were installed around the test section and readings were taken before and after dredging. There were no significant changes in the piezometer readings due to dredging. The data from the test section will be included in the 17th Street Outfall Canal GDM. Based upon a 100 year rainfall in City Park (El. +0.5) and hydraulic gradients from the piezometric readings, a design piezometric headline of El. -3.0 was computed. The design piezometric headline was used in stability analysis between Sta. B/L 0+00 and Sta. 90+50.

28. Pile Foundations.

a. Ultimate compression and tension pile capacities versus tip elevations were developed for 12" and 14" square prestressed concrete piles, timber piles, and HP 14x73 steel H piles plates 41 through 47. Overburden stresses were limited so that the maximum resistance in the sands would be less than 2.0 ksf (Reference Seabrook Lock Design Memorandum No. 2-Detailed Design). Soil design parameters are shown on Plates 39 and 40. Values of cohesion, soil to pile frictional resistance, and lateral earth pressure coefficients for compression and tension used to compute pile capacities are shown in Tables 6, 7, and 8. The results of design pile loads versus tip elevations for cost estimating purposes are based on applying a factor of safety of 2.0 in compression and tension. Pile capacity curves for the T-wall from B/L Sta. 22+40 to Sta. 23+40 and B/L Sta. 29+40 to Sta. 90+50, Plates 42, 43A and 44A neglect pile capacities above the critical slip plane. The HP 14x73 steel H pile capacity curves plate 45 neglect the pile capacity above the critical slip plane for the braced wall.

b. During construction, test piles will be driven and load tested in the project area. The results of pile load tests will be used to determine the length of the service piles.

TABLE 5

Piezometer	B/L Sta.	Location	Elevation in Feet NGVD		
			Tip	Riser	Ground
P-1	18+08	9.3 (Levee C/L)	-21.3	11.7	9.7
P-2	18+11	33.4 (Levee Toe)	-17.5	2.5	0.5
P-3	18+21	191.1 (L.S. Levee C/L)	-19.0	1.0	-1.0
P-4	113+40	8.5 (Levee C/L)	-11.5	12.5	10.5
P-5	113+38	24.9 (Levee Toe)	- 9.6	7.4	5.4
P-6	113+46	196.8 (L.S. Levee C/L)	-11.6	5.4	3.4

TABLE 6

CONCRETE PILES

	Q-Case						S-Case					
	ø	K_c	K_t	N_c	N_q	δ	0	K_c	K_t	N_c	N_q	δ
Clay	0°	1	0.7	9	1.0	0°	23°	1	0.7	0	10.5	23°
Silt	15°	1	0.5	12.9	4.4	15°	30°	1	0.5	0	22.5	30°
Sand	33°	1.25	0.75	0	22.5	33°	33°	1.25	0.75	0	22.5	33°

TABLE 7

TIMBER PILES

	Q-Case						S-Case					
	ø	K_c	K_t	N_c	N_q		ø	K_c	K_t	N_c	N_q	γ
Clay	0°	1	0.7	9	1.0	0°	23°	1	0.7	0	10.5	23°
Silt	15°	1	0.5	12.9	4.4	15°	30°	1	0.5	0	22.5	30°
Sand	33°	1.25	0.75	0	22.5	33°	33°	1.25	0.75	0	22.5	33°

TABLE 8

STEEL H-PILES

Q-Case

	ø	K_c	K_t	N_c	N_q	δ
Clay	0°	1	0.7	9	1.0	0°
Sand	33°	1.25	0.5	0	22.5	23°

c. The settlement of the valve structure is estimated to be between 0 and 0.3 ft. based on consolidation in the first Pleistocene horizon. Differential settlement between 0 and 0.3 ft. will occur since the structure overlies the existing levee and the existing Orleans Outfall Canal.

d. Subgrade moduli curves for estimating lateral restraint of the soil beneath the structure and pile supported T-walls are shown on Plates 41 through 47.

29. <u>Shear Stability</u>.

a. <u>Construction Slopes - Valve Structure</u>. All stability analysis into the excavation utilized piezometric headlines two to three feet below the ground surface. The excavation plan is shown on Plate 5. Stability was determined by the LMVD Method of Planes analysis and based upon a minimum factor of safety of 1.3 with respect to the design shear strength. The borings used to develop a design shear strength profile for the valve structure are shown on Plate 40. Only shear strength tests below elevation -53.0 NGVD were used from borings 6-OUW, 2-OUG, 5-ULO, 1-UOP, and 38. The borings used to develop a design shear strength line for B/L Sta. 90+50 to the lake are shown on Plate 40. A mass stability analysis was made for the centerline of the levee into the excavation as shown on Plate 71. Plates 68 and 72 show stability analyses relative to the excavation for the cantilever wall and braced wall for the 50 year hurricane stage of 9.0 NGVD. The stability analysis for the temporary protection levee of El. 10.0 NGVD into the excavation is shown on Plate 69. The elevation of the temporary levee is equal to the existing levee that will be degraded. Plate 70 shows the stability of the existing east levee into the dredged bypass channel. A construction low water elevation of -2.0 NGVD was used.

b. <u>Final Slopes</u>.

1. <u>Structure and Vicinity</u>. The stability of the approach levees, east closure levee, and west closure levee was determined by the method of planes analysis. These sections are shown in plan on Plate 4. The method of planes analysis was based on a minimum factor of safety of either 1.3 or 1.5 with respect to the (Q) design shear strengths. The factor of safety of 1.5 applies to stability of the levees into the approach channels. The stability analysis for the west levee into the approach channel is shown on Plate 74. The approach levees north and south of the structure have the same embankment section, but the north approach levee has an I-wall in the embankment. Section C-C (Plate 73) shows a stability analysis of the north approach levee to the protected side. The stability analysis of the east and west closure levees were made for three different stillwater levels. Case 1 is for a high level lake elevation of 11.6 NGVD and a protected side canal water elevation of 2.0 NGVD. Case 2 is for a lake elevation of 7.0 NGVD and protected side canal water elevation of -5.0 NGVD. Case 3 is for a lower water elevation of -5.0 NGVD in the lake. Section I-I, (Plate 78)

is a stability analysis of the east closure levee for Case 1. Section J-J (Plate 79) is a stability analysis of the east closure levee for Case 2. Section K-K (Plate 80) is a stability analysis for the east levee closure for Case 3. The factor of safety of 1.3 applies to the stability of sections I-I, J-J, and K-K of the east levee closure. Section L-L (Plate 81) is a stability analysis for the east closure levee into the north approach channel for a Case 3 water elevation. Section M-M (Plate 82) is a stability analysis for the east closure levee into the south approach channel for Case 2 water elevation. Sections F-F and G-G on Plates 75 and 76 are stability analyses for the west closure levee into the south approach channel for Case 1 and Case 2 water elevations. Section H-H (Plate 77) shows a flood side stability analysis for the west closure levee into the north approach channel for a Case 3 water elevation.

2. Parallel Protection Plan. The stability of the levees along the Orleans Avenue Outfall Canal from the lakefront levees to the pumping station was determined by the method of planes analysis. The method of planes analysis was based on a minimum factor of safety of 1.3 with respect to the (Q) design shear strengths. Plates 56 through 59 show flood side and protected side stability analyses for the existing levee from B/L Sta. 90+50 to the lakefront levees for both the east and west sides. Maximum levee sections with minimum ground elevations were used in the stability analyses. The clay layer between El. -8.0 NGVD to El. -20.0 NGVD from the shear strength design profile B/L Sta. 90+50 to the lake was replaced by a silt layer from B/L Sta. 104+00 to the lake. For B/L Sta. 0+00 to 90+50, shear strengths from the borings shown on the design shear strength plate were used to develop a design shear profile for the east levee centerline. The levee toe shear strength profile for the east and west side, B/L Sta. 0+00 to 90+50, was developed from the borings shown on the design shear strength profile. The shear strengths from borings 3-OUW, 8-OUG, 6, 10, and 34 were used to develop a shear strength profile for the west levee centerline, B/L Sta. 0+00 to 90+50. The west levee has a crown elevation varying between El. 4.5 NGVD and El. 6.0 NGVD, with no landside toe but an earth supported retaining wall, while the east levee crown elevation varied between El. 9.0 NGVD and El. 10.0 NGVD. Plates 48 through 55 present protected side and flood side stability analyses for I-wall in levee sections from B/L Sta. 0+00 to 90+50 east side. The existing levees were degraded to maintain the alignment of the existing flood protection. The section for B/L Sta. 64+00 to 90+50 East minimizes the amount of protected side fill. The section was requested by OLB to reduce the impact on the existing trees. Plates 60 and 61 show stability analyses for the I-wall in levee from B/L Sta. 2+44 to 29+40 west side except B/L Sta. 22+80 to 23+40 where a T-wall will be used. Orleans St. will be raised 1.5' at the toe of the levee and will slope down to the existing drainage ditch. At Sta. 22+80 to 23+40 Orleans St. elevation dropped significantly; therefore a T-wall was used. Plate 63, B/L Sta. 29+40 to Sta. 50+00 is the most critical floodside stability analysis for the T-walls from B/L Sta. 29+40 to Sta. 90+50. As shown on Plate 65A, a temporary sheetpile cofferdam will be driven to allow construction of the T-walls. The existing floodwall will be

degraded. The shear stability safety factor for the temporary sheetpile wall of 1.09 is considered sufficient since it is above the existing safety factor of 1.02 at EL. -33.0 for a 50-yr stage.

30. I-Walls. The required penetration of the steel sheet piling below ground surface was determined by the method of planes using an "S" shear strength of C=0 and 0=23° for the clay strata, and 0=30° and C=0 for silts. "Q" case design strengths are based on data shown on Plates 39 and 40. The factors of safety were applied to the design shear strengths as follows: 0 developed = arctan (tan 0 available/factor of safety). Using the resulting shear strengths, net lateral soil and water pressure diagrams were developed for movement toward each side of the sheet pile. With these pressure distributions, the summation of horizontal forces was equated to zero for various tip penetrations, and the overturning moments about the tip of the sheets were determined. The required depth of penetration to satisfy the stability criteria was determined where the summation of the moments was equal to zero. The following is sheetpile wall design criteria for hurricane protection levees:

Q-Case

F.S. = 1.5 with water to SWL
F.S. = 1.25 with water to SWL and waveload
F.S. = 1.0 with water to SWL + 2 ft. freeboard

S-Case

F.S. = 1.2 with water to SWL and waveload (if applicable)

If the penetration to head ratio is less than about 3:1, it is increased to 3:1 or to that required by the S-Case, F.S. = 1.5, whichever results in the least penetration. The SWL is used to calculate head for penetration to head ratio.

a. Floodwalls. Cantilever floodwalls will provide protection from B/L Sta. 0+00 to 90+50 east side. B/L Sta. 2+44 to 29+40 west side, and B/L Sta. 90+50 to the lakefront levees for both sides as shown on Plates 83 through 90A. The east and west levee closures for the valve structure will have cantilever floodwalls.

b. Construction Floodwalls. A cantilever floodwall, Plates 94 and 95, will be used to transition from the braced wall to the existing levee embankment for the Cofferdam of the valve structure excavation. The cantilever floodwall shown on Plate 93 will provide temporary flood protection during construction of the T-walls from Sta. 29+40 to 90+50 west side. The same sheet pile will be reused; therefore, only the critical section between Sta. 64+00 and 90+50 was presented.

c. Approach Channel Wingwalls. The cantilever walls are being placed in the channel slope with little or no material being retained as shown on plate 4. The cantilever walls were checked for stability which required little sheet pile tip penetration. The sheet piles were also checked for axial load capacity. The loads on the sheet pile are the concrete cap and on the east side the shell closure section. The elevations shown for the approach walls are based on a F.S. = 3.0 for pile capacity and for settlement. Sample calculations are shown in Appendix B.

d. Braced Walls. A sheet pile braced wall with HP 14x73 steel H-pile anchorage (Plate 96) will provide flood protection for the excavation during construction of the structure. The natural ground next to the braced wall was lowered until the critical wedge for shear stability was at the wall. The sheet pile was extended through the bottom of the sand stratum to cutoff seepage.

31. T-Walls. A deep seated analysis utilizing a 1.3 factor of safety incorporated into the soil properties was performed for various potential failure surfaces beneath the T-walls. The analyses are shown on Plates 62, 64, and 66 for Sta. 29+40 to 90+50 west side. The summation of horizontal driving and resisting forces results in a value that is positive indicating that the load on the base must be equal to or greater than the load on the failure critical surface. The base of the T-walls was lowered until the at-rest force equaled or was greater than the positive unbalanced load on the critical failure surface. Lateral earth pressure diagrams for the T-walls are shown in Appendix B.

32. Levee Settlements. The following settlement estimates were based on theoretical analysis. The settlement of the east levee closure is estimated at 0.75 ft. The settlement at the east levee and valve structure interface is estimated at 0.25 ft. No consolidation is expected at the interface of the valve structure and west levee closure; however, shrinkage of the fully compacted backfill will result in 0.2 ft. of settlement. The estimated settlement of the west levee closure is 1 ft., which is primarily shrinkage of the backfill. The estimated settlement of the west approach levees to the valve structure is 2 ft. The west approach levees, with a 10 ft. crown width and net El. 10.0 NGVD, will be constructed over the existing construction levee of 4 ft. crown width and crown El. 10.0 NGVD. Sample calculations are shown in Appendix B.

DESCRIPTION OF PROPOSED STRUCTURE AND IMPROVEMENTS

33. Butterfly Valve Structure.

The proposed structure is based on the theory of a self-opening and closing, vertical, eccentrically pinned, butterfly gated structure. The butterfly gates would remain open during pumping of the interior drainage to the lake as long as the water level in the outfall canal exceeded that on the lake side of the structure (Plate 2) and close only when an incoming surge created a water level greater than that in the outfall canal on the pumping station side of the structure. This would permit continuous operation of the pumping station during a hurricane and reopening of the gates when the water level in the outfall canal downstream of the pumping station during a hurricane and reopening of the gates when the water level in the outfall canal downstream of the pumping station exceeded that on the lake side of the control structure. In the open (trimmed) position, the axis of each gate would be 12 degrees from the center line of each gate bay (Plate 9). During a surge flow, the eccentricity of the pin and the 12-degree offset (trim) would induce closing of the gates. The structure will provide (4) 28' x 16' openings with the sill at elevation -10.0.

The structure will consist essentially of four reinforced concrete gate bays supported by prestressed concrete piles, reinforced concrete approach aprons supported by untreated timber piles, and reinforced concrete capped sheet pile approach guide walls. The machinery house, which serves as part of the flood protection above elevation 8.5, will be located over the gates. Each gate bay will be provided with slots for needle beams and needles so that the gate bays can be dewatered for repair or painting of the valves. Protection against seepage under the structure will be provided by steel sheet pile cutoffs extending to EL. -25.0 under the structure as well as under each approach apron. See Plates 4 through 12 for details.

34. Channel Closure.

A combination shell embankment with I-wall will close the existing channel after completion of the structure. The shell embankment will have a 10-foot crown at elevation 7.5 I-wall will be constructed in the embankment crown to elevation 13.6 (net) (see Plates 4 and 6).

35. Floodwall.

I-type floodwalls will be provided at the following locations:

a. Sta. 0+00 West W/L to Sta. 20+84.51 West W/L. This floodwall is on the west bank of the Orleans Avenue Canal. At Sta. 0+00 W/L, the new floodwall will tie into the new butterfly valve structure, and at Sta. 21+34.51 West W/L, it will tie into the existing Lakefront levee system (see Plates 2 and 3).

b. <u>Sta. 2+07 East W/L to Sta. 24+95.17 East W/L</u>. This floodwall follows the east bank of the Orleans Avenue Canal. At Sta. 2+07 East W/L, the new floodwall will tie into the new channel closure, and at Sta. 24+95.17 East W/L, it will tie into the existing Lakefront levee system (see Plates 2 and 3).

36. <u>Butterfly Valve Operating Machinery</u>.

a. The machinery is designed for automatic and manual gate operation. In the automatic mode the gate is powered by the water hydraulic forces acting on the gate. In this mode the machinery acts as a dampner and shock absorber. Damping time will be field adjustable and accomplished with two hydraulic cylinders and a set of parallel adjustable nonpressure compensated and pressure compensated flow control valves. The nonpressure compensated flow control valves will provide for low pressure damping, below 200 psi, while the pressure compensating valves will provide for a control rate of damping above a system pressure of 200 psi.

b. Manual operation of the gate is accomplished by powering the damping cylinders with a hydraulic power unit consisting of a hydraulic pump driven by an electric motor. In this manner approximately 417 to 513 Kip-Ft of torque can be imparted to the gate at the hinge for swinging the gate in either direction.

c. Incorporated with the machinery is a spring. The spring is designed to assist the gate's closing forces generated by tidal flow from the lake into the canal by providing the gate with a preliminary closing torque of approximately 10 Kip-Ft when the gate is fully open and lesser torques as the gate moves towards the closed position. Because the opening forces due to drainage pumping is approximately 20 to 25 Kip-Ft the spring loading will not increase the head across the structure.

37. <u>Gate Bearings</u>.

The pintle will be a spherical bearing. The ball will be stainless steel and the bearing will be a high lead bronze such as ASTM B584-932. The top bearing or hinge will be a commercially available spherical roller bearing.

Plate 12 illustrates the machinery layout and the design of the hinge and pintle.

38. <u>Drainage Facilities and Utility Lines</u>.

There are no known drainage facilities or utility lines which will be affected by the project plan.

39. <u>Method of Construction</u>.

Construction will begin with the cantilever wall, the H pile braced wall and excavation of the bypass channel. The braced wall and cantilever wall will be constructed to a 50 year hurricane occurrence. The temporary dike will be constructed to the existing levee elevation. Spoil from the bypass channel will not be suitable for the temporary dike. The temporary dike will be constructed with excess material from the existing levee. The water within the wall area can be pumped down to El -5.0 NGVD without degrading the existing levee. For normal water conditions the water can be completely pumped out of the excavation and a dewatering system installed with excavation no lower than El -5.0 NGVD. Once the dewatering system is complete, excavation can proceed to El -15.0 NGVD. When the structure is completed, the east closure area within the braced wall will be excavated to El.-9.0 NGVD. The east closure I-wall will be driven between the structure and the braced wall. The braced wall and cantilever wall will be removed and the structure flooded. The remaining east closure section will be completed. The west closure levee will be completed and a temporary dike will be enlarged to a permanent levee section.

40. <u>Cathodic Protection and Corrosion Control</u>.

a. <u>Cathodic Protection for Steel Sheet Piling</u>. All steel sheet piling will be bonded together to obtain electrical continuity and no corrosion protection measures will be provided. Cathodic protection can be installed in the future if the need arises. The sheet piles will be bonded together with a No. 6 reinforcing bar welded to the top of each pile. Flexible jumpers insulated with cross-linked polyethelene will be welded or brazed to adjacent sheet piles at the monolith joints 3 inches below the bottom of the concrete.

b. <u>Corrosion Control</u>. The steel butterfly gates, corner plates, and all ferrous metal components which are not galvanized or stainless steel will be coated with a paint system consisting of a zinc rich epoxy primer and two coats of coal tar epoxy as required for corrosion control.

ACCESS ROADS

41. <u>Access Roads</u>. Vehicular access to the project site is available via many roads. Major thoroughfares which provide access to the project area are Lakeshore Drive and Robert E. Lee Boulevard, Marconi Boulevard on the east and General Haig on the west Traverse the site.

SOURCES OF CONSTRUCTION MATERIALS

42. Sources of Construction Materials.

a. Concrete.

1. Quantities and qualities.

	Structural Feature	Concrete Quantity	28 Day* Compressive Strength (psi)
Cast-in-Place	Stab Slabs	149 CY	2,500
	Other Items	4,843 CY	3,000
Precast Concrete	Piles, 14x14	22,200 LF	5,000
	Needles	-	3,000
	Needle Girders	-	3,000

*90 days if pozzolan used

2. Environmental Conditions. The concrete will not be subjected to any critical environmental or functional conditions.

3. Specification Requirements. Concrete construction will be specified using CW-03301, entitled "Cast-in-Place Structural Concrete" as a guide. Because of the nature of local aggregates, low alkali cementitious materials will be specified.

4. Commercial Ready Mix. Ready mix concrete meeting the requirements of this project and produced from batch plants meeting the guidelines of Cast-in-Place Structural Concrete (CW-03301) is available from several area ready mix companies.

5. Sand and Gravel. For this project, 3/4" and 1 1/2" or 1" nominal size aggregate will be used. Several area sources are capable of furnishing sand and/or gravel meeting ASTM quality and ASTM or Louisiana State Department of Transportation and Development gradation requirements.

b. Other Materials.

1. Rip-Rap. Stone is available from Corps approved sources in Arkansas, Missouri, Kentucky and Illinois for the 460 tons of rip-rap needed.

2. Shell. The 9,720 cubic yards of clam shell required can be provided by at least three local suppliers from adjacent Lake Pontchartrain.

RELOCATIONS

43. General. Under the authorizing law, local interests are responsible for the accomplishment of "...all necessary alterations and relocations to roads, railroads, pipelines, cables, wharves, drainage structures and other facilities made necessary by the construction work,...". There are no relocation requirements for the recommended butterfly valve plan.

REAL ESTATE REQUIREMENTS

44. General. All right-of-way needed to construct the project plan (fronting protection) are currently with in the existing Orleans Levee Board right-of-way and/or canal bottoms. No additional rights-of-way are required for the project plan. Since the Orleans Levee Board intends to build parallel protection plan, there will be additional rights-of-way needed. Acquisition of the addition rights-of-way are solely the responsibility of the Orleans Levee Board. Additional right-of-way requirements for the parallel protection plan are shown in Volume II.

COORDINATION WITH OTHER AGENCIES

45. General. As previously mentioned, the State of Louisiana, Department of Public Works, was appointed project coordinator for the State by the Governor of Louisiana. This agency has functioned to coordinate the needs, desires, and interests of state agencies and the Corps of Engineers. The Orleans Levee Board has provided the local cooperation for this feature of the hurricane protection project. The project plan presented herein will be used to establish the limits on cost sharing that the Federal Government will contribute towards construction of the parallel protection plan. This position has been explained to the engineering staff and representatives of the Levee Board. The Levee Boards funding for parallel protection has been based upon this cost sharing premise. The entire Lake Pontchartrain Hurricane Protection Project, including this project feature, has been discussed at numerous public and private meetings since its authorization. Such meetings have been held before regional, state, local, community, social, and educational organizations and have served generally to inform the public of the proposed works, to explain project functions, and to solicit the public coordination required for input to the Draft Supplemental Environmental Impact Statement (DSEIS) of the Lake Pontchartrain project as a whole. The Environmental Assessment (EA) for work on the Orleans Avenue Outfall Canal was provided to the Public in July 1988. A copy of the EA and the finding of no significant impacts (FONSI) is contained in Appendix A of this report.

AFFECTED ENVIRONMENT

46. Introduction.

The Orleans Canal runs from a pumping station near Interstate Highway 610 north to Lake Pontchartrain, a distance of 2.6 miles (see Plate 1). On the west side, the southern 1.8 miles are bounded by a levee topped with a concrete I-wall. The rest of the canal is bounded by earthen levees. Five bridges cross the canal. Orleans Avenue lies immediately adjacent to the levee right-of-way on the west; houses line the west side of the street. Marconi Drive parallels the canal on the east side, varying in distance from 150 feet to 500 feet from the levee. City Park property is immediately adjacent to the levee right-of-way on the east side. The Lakeshore Linear Park lies on both sides of the canal near the lake. Any borrow material required for the project would be obtained from Corps approved borrow sites in the Bonnet Carre Spillway.

47. Biological. The predominant vegetation on the levee is perennial grasses. Plants along the additional right-of-way include perennial grasses, herbs, ornamental shrubs, and pines, hackberries, and oaks. Due to regular mowing and human disturbance, the levee and surrounding terrestrial habitat does not provide significant wildlife habitat. There is some use of shrubs and trees by squirrels and songbirds. Some marsh grass lines the canal on the inside of the levee, covering approximately 2 acres. No threatened or endangered species or their critical habitat exist in the project area.

Water quality in the canal is poor. Dissolved oxygen is often low and the sediments contain traces of heavy metals and pesticides. Due to the poor water quality, the canal itself is of low value as aquatic habitat for fishery resources with species such as mosquito fish, mullet, gar and blue crabs predominant. The nearshore lake waters adjacent to the mouth of the canal provide habitat of moderate value for nursery and feeding of some estuarine dependent commercial and sport fish and shellfish. Benthos in the canal and nearshore lake consists of snails, Rangia clams and worms. This canal and nearshore area are used as feeding and resting areas by terns, gulls, egrets and occasional ducks.

48. Recreation. Recreational opportunities abound in the vicinity. As described above, 2/3 of the canal is bounded by green spaces with an esthetically pleasing mixture of grass, oaks, and pines. These trees add to the scenic beauty and provide shade for various recreational activities. The levee on the east side provides a green backdrop screening the view of the neighborhood beyond. The levee is used by joggers, walkers, bird-watchers, bicyclists, and some fishermen. The adjacent parks provide areas for field sport activities, picnicking, and

similar activities. The New Orleans Recreation Department operates the Gernon Brown Memorial Recreational Center adjacent to the levee at Harrison Avenue. This building is used for indoor games, recreation, and community activities.

49. Cultural. The project area includes an existing levee corridor on post-1930 reclaimed land and the artificial channel of the Orleans Avenue Canal. No cultural resources are recorded in the vicinity of the proposed work.

50. Noise. The background noise levels for the project area are approximated to range from 70 DBA in the project reaches located in residential areas on the west side south of Robert E. Lee Blvd. to 50 DBA in the quieter park like residential areas north of Robert E. Lee Blvd. and in City Park itself.

Edward Hayne Elementary School lies just west of the floodwall at Harrison Avenue.

ENVIRONMENTAL EFFECTS

51. Biological Impacts.

a. Butterfly Valve Alternative.

Structure placement and associated dredging would result in the loss of 3 acres of marginal benthic habitat through burial. Sessile and slow moving organisms such as mollusks would be lost. Fish are mobile enough to avoid impacts. Temporary displacement of other benthic and aquatic life would occur during cofferdam placement. Turbidity would increase, thus decreasing primary production and increasing oxygen demand. Resuspension of contaminated sediments in the water column could occur during construction.

The terrestrial impacts associated with the alternative are minimal and would involve the loss of approximately 0.13 acres of developed green space adjacent to the Orleans Avenue canal. Impacts resulting from the placement and handling of the dredged material removed from the canal bottom could potentially be sources of pollution if not contained in a properly secured site.

b. Parallel Protection Alternative.

Approximately 15 acres of low value wildlife habitat including 162 trees (45 of which are oaks) would be impacted by degrading, earth moving and shaping operations. The new levee would provide habitat similar to the existing levee. The loss of mature trees would remove them from the ecosystem until the replacement trees mature. The new levee would provide habitat similar to one existing levee. Ten young oaks would be planted for every mature tree taken. Three young pines would replace each mature pine. In addition, approximately 2 acres of marsh grass and associated fishery habitat would be affected by degrading and upgrading the existing levee. Runoff during construction would slightly increase turbidity in the canal and the amount of airborne dust in the project area. Once the levee becomes vegetated, this impact would be eliminated.

52. Endangered Species Impacts.

No endangered or threatened species or their critical habitat would be impacted. Resource agencies have been contacted and concur.

53. Recreational Impacts.

a. Butterfly Valve Alternative.

Construction of the cofferdam and the structure would interrupt the minimal fishing and crabbing activities that occur in the bayou mouth. Noise during construction could disrupt bird-watching activities temporarily. The completed structure would have essentially no impact on recreation.

b. Parallel Protection Alternative.

All use of the five miles of earthen levee would be disrupted during construction. Once the protection is completed, there would be only 0.8 miles of earthen levee remaining (north of Robert E. Lee Blvd. and west of the canal). Once revegetated, this levee would support recreational activities similar to those occurring now, although on a levee that is about 5 feet higher than the present levee. The remainder would be floodwall. This floodwall would restrict pedestrian access to the water along most of the canal.

54. Esthetic Impacts

a. Butterfly Valve Alternative Impacts

Construction would temporarily increase noise and dust in the area. The completed structure would be relatively small and its esthetic impacts minimal.

b. Parallel Protection Impacts

Increasing the height of the levee, replacing levee with floodwall, and replacing floodwall would cause significant impacts to the esthetic environment, including temporary noise and dust during construction. The loss of 162 trees would be an adverse impact until the replacement trees reach maturity. The soft, green visual effects of the earthen levee would be replaced by a more harsh visual barrier where the floodwalls are constructed. The harsh aspect could be softened by a textured surface treatment.

55. Cultural Impacts.

a. Butterfly Valve Alternative.

No impacts to significant cultural resources are anticipated and no cultural surveys are warranted.

b. Parallel Protection Alternative.

No impacts to significant cultural resources are anticipated. Therefore, no cultural resource survey is warranted.

56. Noise Impacts.

a. Butterfly Valve Alternative.

Installation of this structure would require several construction stages including pile driving, backfilling, slab construction and finishing work.

The greatest source of noise will be the pile driving activity. This construction activity would be performed in a non-continuous fashion for approximately 108, 10-hour days.

The greatest exposure would be encountered in the park adjacent to the construction. Exposure levels here would range from 95-105 DBA. This level of noise intrusion would interfere with passive recreation such as pleasure walking, picnicking, and bird watching, etc. In addition, some interference with oral communication could be expected near the construction site.

Residences within the project area would be exposed to piledriving noise levels which range from 77 dBA to 95 dBA for 108 days depending on the distance from the source. Approximately 4 homes would be exposed to 89-95 dBA, 11 homes to 83-89 dBA and 48 homes to 77-83 dBA. These are exterior noise levels and therefore interior noise exposure should be less.

Construction workers would have protective hearing devices. Since construction would take place during daylight hours, sleep interference should occur only for napping children and day sleepers. Noise affects many bodily functions (heart rate, respiratory volume, digestive secretions, hormonal secretions, etc.). If prolonged, the construction noise levels could produce significant physiological damage. However, the relatively short duration of the noise should prevent such problems from occurring. The noise would definitely be highly annoying to inhabitants of the 63 residences within 400 feet of the actual work site. During the time the noise was higher than 85 dBA, it would be difficult to hold a conversation within the impacted house and recreational areas.

The remaining construction activities including slab construction (72 days) backfill operation (10 days) and finishing work (10 days) produce heightened noise levels ranging from 63-95 dBA. Four home would be exposed to 76-95 dBA, 11 homes to 70-89 dBA and 48 residences to 63-83 dBA. Again these are exterior noise levels, therefore the interior exposure to noise would be much less.

b. Parallel Protection Alternative.

This method of construction results in increases in noise levels produced from degrading and upgrading existing levees with higher floodwalls. The noise levels expected for the proposed construction would range from 95-105 dBA when measured 50 feet from the center of the noise source. One green space and portions of Haney Elementery School sould be exposed to noise levels ranging from 95-105 dBA. Approximately 168 residences would be exposed to noise levels ranging from 77-95 dBA. The level of noise with the majority of the houses (183) being exposed to 77-83 dBA. Ambient noise level for the area is 50-70 dBA. Therefore, during construction, the noise levels would increase a maximum of 35-45 dBA above ambient. This level of increase is not expected to significantly interfere with residential activity since most of the work will be done during daylight hours and exposure levels inside the homes would be further reduced.

COMPLIANCE WITH ENVIRONMENTAL LAWS

57. General.

An Environmental Assessment and unsigned FONSI will be prepared and circulated for public comment. Compliance with the Endangered Species Act has been achieved. Cultural compliance has been achieved.

If parallel protection is chosen, no Section 404(b)(1) Evaluation or CZM Consistency Determination would be necessary. If the butterfly valve alternative is chosen, both of these documents would need to be prepared.

ALTERNATIVE PLANS CONSIDERED

58. Introduction.

Several alternative plans are available to accomplish hurricane protection of the project area. The plans include the following:

a. Parallel Protection: The parallel protection plan includes floodwalls along each bank of the Orleans Avenue Canal from the Lakefront to the Pumping Station No. 7.

During the development of this design memorandum, this plan was considered in detail. This plan provides for upgrading the existing earthen levees along both sides of the outfall canal, to contain the SPH within the canal. This involves supplementing the existing levee with I-type and T-type floodwalls where feasible. The floodwall would tie into the existing lakefront levee at the lakefront and cross the canal in front of Pumping Station No. 7 at the south end of the canal.

There are five bridges across the canal between the lake and the pumping station. As part of the parallel protection plan, two sub-alternatives are available for hurricane protection at three of these bridge locations. The Interstate 610 bridge has sufficient height to clear the proposed parallel protection and Lakeshore Drive will remain outside of the levee system. Table 10 contains a summary of estimated cost for the parallel protection plan. Itemized costs are contained in Appendix C.

1. Roller-Type Floodgates: Provide roller-type steel floodgates at each end of the bridge crossings. These gates will tie into the proposed levees and/or floodwalls and will be closed during a hurricane event, thus shutting-off all traffic across the outfall canal.

Estimated cost of the parallel protection plan with roller-type floodgates at all four bridge locations is approximately $1,000,000 less costly than the floodproofing plan. Costs for the road gates are detailed in Appendix C.

2. Bridge Floodproofing: Flood proofing of bridges across the outfall canal was investigated by the A-E firm of Design Engineering Inc., consultants for OLB. Based on the A-E's investigations, estimated cost for floodproofing the bridges, including contingencies, E&D, and S&A, is $2,000,000. The comparative cost of the parallel protection plan, supplemented by the bridge floodproofing, is estimated at approximately $42,500,000.

From a hydraulic standpoint, the option of floodproofing the bridges does not pose any problem, as the velocities through the bridge waterways are small (ranging from 1.5 to 3.3 ft/sec). The SWBNO favors the parallel protection plan with bridges modified to contain water in the canal. They maintain that this plan does not restrict or impair their ability to provide storm drainage during rainfall events concurrent with hurricane-related high elevations in the lake.

TABLE 9
LAKE PONTCHARTRAIN, LOUISIANA AND VICINITY
ORLEANS OUTFALL CANAL
SUMMARY FIRST COST PARALLEL PROTECTION
(OCT 88 Price Levels)

Cost Acct. No.	Item	Description	Amount
11	1	HARRISON AVE. TIE-IN STA. 36+14.85 TO STA. 37+14.85	$ 32,483
	2	FILMORE AVE. TIE-IN STA. 63+77.7 TO STA. 64+51.7	26,982
	3	ROBERT E. LEE TIE-IN STA. 91+22.25 TO STA. 91+21.25	54,307
	4	REACH W-6 I-WALL STA. 91+15.16 TO STA. 91+82	30,354
	5	REACH W-6 I-WALL STA. 91+82 TO STA. 118+87	715,360
	6	REACH W-7 I-WALL STA. 118+87 TO STA. 124+87	215,751
	7	REACH E-6 I-WALL STA. 91+21.25 TO STA. 91+84.58	50,275
	8	REACH E-6 I-WALL STA. 91+84.58 TO STA. 118+67	963,748
	9	REACH E-7 I-WALL STA. 118+67 TO STA. 124+67	242,822
	10	REACH E-7 I-WALL STA. 124+67 TO STA. 128+67	173,743
	11	* REACH E-1 I-WALL STA. 2+42 TO STA. 3+65	49,869
	12	* REACH E-1 I-WALL STA. 3+65 TO STA. 36+14.85	883,829
	13	* REACH E-2 I-WALL 37+14.85 TO 44+04 & 44+74 TO 50+00	425,546
	14	* REACH E-3 I-WALL STA. 50+00 TO STA. 63+77.75	557,711
	15	* REACH E-4 I-WALL STA. 64+51.7 TO STA. 90+22.25	1,306,412
	16	* REACH W-1 I-WALL STA. 2+40 TO STA. 3+62	112,317
	17	* REACH W-1 I-WALL STA. 3+62 TO 22+80 & 23+40 TO 29+40	1,795,254
	18	* REACH E-2 T-WALL STA. 44+04 TO STA. 44+74	64,119
	19	* REACH W-1 T-WALL STA. 22+80 TO STA. 23+40	107,785
	20	* REACH W-2 T-WALL STA. 29+40 - 36+28.35 & 37+00.35 - 50+00	4,147,959
	21	* REACH W-4 T-WALL STA. 50+00 TO STA. 63+76.76	2,187,785

TABLE 9 (Cont'd)
LAKE PONTCHARTRAIN, LOUISIANA AND VICINITY
ORLEANS OUTFALL CANAL
SUMMARY FIRST COST PARALLEL PROTECTION
(OCT 88 Price Levels)

Cost Acct. No.	Item	Description	Amount
11	22	* REACH W-5 T-WALL STA. 64+54.7 TO STA. 90+14.66	5,404,370
	23	PUMPING STATION T-WALL TIE-IN	100,709
	24	MOB AND DEMOB	60,000
	25	ENVIRONMENTAL PROTECTION	20,000
		SUBTOTAL	$19,729,488
	26	PUMPING STATION MODIFICATION	170,530
	27	PUMPING STATION COFFERDAM	258,500
	28	HARRISON AVENUE BRIDGE	385,073
	29	FILMORE AVENUE BRIDGE	436,090
	30	ROBERT E. LEE BRIDGE	531,874
02	31	UTILITY RELOCATIONS:	
		a) 30" DIA. WATERLINE AT STA. 44+50; $5,000/SIDE	10,000
		b) O.H. POWERLINES AT STA. 4+50,37+20,50+50; $3450 ea	10,350
01	32	LANDS AND DAMAGES ID NO. 80616 TOTAL	$ 9,367,000
		SUBTOTAL, CONSTRUCTION	$21,531,904
		25% CONTINGENCIES	5,368,096
		TOTAL CONSTRUCTION (R)	26,900,000
		ENGINEERING & DESIGN (12%±)	3,200,000
		SUPERVISION & ADMIN. (10%±)	3,000,000
		OCT. '88 COST TOTAL COST (R)	$42,500,000

* Denotes Phase I and Phase II Construction

Regarding the option of providing roller-type floodgates versus floodproofing the bridges, OLB, along with the City Planning Commission, are totally opposed to closing-off the bridges during hurricane events (as envisioned with roller-type gates at bridge crossings). OLB's A-E has prepared designs for structural modifications of these bridges to contain flow within bridge waterways during hurricane events. A copy of an August 26, 1986 letter from the City of New Orleans Department of Streets insisting that the bridges over the canal "remain open at all times" is reproduced in Appendix A. DEI's response to the letter is also included in Appendix A.

The parallel protection plan is favored by the SWBNO. Although it has potential operational advantages over the butterfly valve structure, it is not recommended as the project plan. The cost associated with this plan is several times higher than the recommended project plan.

b. Miscellaneous Gated Structures at Lakefront: The overall concept and principal of the gravity drainage structures with different types of gated structures is the same as the project plan. The following type of structures were considered:

1. Vertical Lift-Gated Structure: The feasibility of a lift-gated structure was investigated. The structure can be designed with monitoring equipment capable of detecting significant flow reversals at the structure and activating gate closure. Manual override capability can also be incorporated in the system. This alternative has an advantage over the project plan. There are several prototype facilities available whereby the design and reliability of such a structure does not need to be verified through model studies. Estimated cost for the vertical lift-gated structure is approximately $9,300,000. From an aesthetic standpoint, this plan does not appear favorable. The structure would protrude well above the surrounding area and will appear to be out of harmony with adjacent lakefront appearance or character. Itemized cost estimates for the vertical lift-gated structure are given in Appendix C.

As discussed above, although an electronic monitoring and control system can be designed for automatic activation, the system would require constant maintenance and validation. The level of confidence of the automatic system operation under the dynamic conditions of a relatively rare standard project hurricane event, is questionable. Invariably, to be safe, a predetermined set of conditions for closing the gates will have to be established and agreed upon. SWBNO does not favor any such pre-arrangements. They are adamantly against any plan which has the potential to reduce their pumping capability. Due to a combination of several of these factors, this alternative is not recommended as the project plan.

2. Sector-Gated Structure: The possible use of a sector-gated structure was investigated. A monitoring and control mechanism, as discussed under the above option, can also be used for this type of structure. This type of structure is aesthetically less objectionable

than the vertical lift gates. No extensive superstructure is required for housing the gates and machinery. From a hydraulic standpoint, flow characteristics are good under a wide range of discharges. Head loss can be kept to a minimum. Considering the operation of these gates during hurricane events, the reliability of the automatic motoring and control mechanism is considered similar to the above alternate. Consequently, pre-determined gate closure conditions will have to be established and agreed upon, making this an undesirable alternative for SWBNO. Due to the relatively large size of each gate, potential failure of the control mechanism during gate closure operation could leave the city vulnerable to flooding. Rough order of magnitude cost of this alternate is $14,900,000, significantly higher than the project plan. Based on these factors, this alternative is not recommended as the project plan. Itemized cost estimates for the sector-gated structure are contained in Appendix C.

3. Vertical Lift-Gated Structure with Flap Valves: The alternate of vertical lift gates with built-in flap valves was also considered.

In theory, this alternate appears feasible under the conditions when the lake level starts rising and the lift gates are closed prior to the lake reaching the SPH elevation. The flap valves could allow flow into the lake provided the effective head on the canal side is higher than the lake side. In theory, this could help improve the pumping efficiency at the south end; however, flap valves will be rendered inactive when the water elevation on the lake side reaches hurricane stage or is higher than the canal side elevation. At that point, functionally, this alternative would be identical to any of the gated structure alternates. It should be mentioned that the pump efficiency is somewhat "self-adjusting" by virtue of the fact that tailwater stages will go up as pump efficiency decreases. It appears that the "self-adjusting" aspect of the pumping system may make the reduction in pumping capacity a minor factor.

From an operational standpoint, this alternate is less attractive than the project plan. Under the project plan, as long as the lake side elevation is lower than the canal side without gate closure, flow should continue towards the lake, serving the same function as the flap valves. The remaining tangible factors for comparison between this alternate and the project plan are the reliability, aesthetics, local acceptability, O&M requirements, and costs. When compared with the project plan, this alternate is not favorable, and was not selected as the project plan.

c. Gravity Drainage Structure with Supplemental Pumping at Lakefront: Use of the floodgates at the lake end of the canal in conjunction with auxiliary low-head pumping station was considered to be a possible solution for land side flood protection after the gate closure. A rough order of magnitude cost of this alternate was also developed. The SWBNO has expressed strong opposition to this concept. Their prime concern is that from an operational standpoint, the "tuning" of discharge between existing pumping station and the auxiliary pump would be hard to achieve. In the event that the stations should become out of synchronization, instabilities in flow could result in undulations in water surface profile, causing damage to the station. Due to strong local opposition, no further consideration was given.

d. U-Shaped Reinforced Concrete Channel: This alternate would replace the existing canal with a U-shaped concrete channel, with no structure at the lake end. From a functional standpoint, this alternate is similar to the alternate of Parallel Protection, which was ruled out due to excessive cost. A rough order of magnitude cost of this alternate is well over $100,000,000. Due to obvious cost reasons, this alternate was ruled out without further considerations.

e. Replacement of Existing Pumping Station with a New Station at Lakefront: Estimated first cost of this alternate is approximately $160,000,000. Due to reasons cited above, this alternate was ruled out in the initial phase of this report development.

59. Plan Selection.

The task of providing hurricane protection for the outfall canals present some unique problems. On the one hand, the highly urbanized area to be protected is low-lying and must depend on the pumping stations for storm drainage for all rainfall events. On the other hand, hurricane protection demands full closure of the lakefront side of the canal during the standard project hurricane event. In the process of plan formulation, practically all conceivable alternatives were considered. Fronting protection which is designed to accommodate interior drainage, fully meets the mandate of the Project Authorization. With the line of hurricane protection established at or near the lakefront, the levees on the protected side of the structure are considered to be interior drainage features. Any existing limitations which the interior drainage system currently has will not be affected with construction of the proposed fronting protection. The limitations referred to here concern the capability of the Pumping Station No. 7 to pump against high lake stages, i.e. reduced pump efficiency, and inadequate freeboard of the existing lateral levees. Sewerage and Water Board of New Orleans has indicated to the New Orleans District that one of their long range goals is to achieve a pumping capacity, capable of evacuating a 5 inch - 5 hour rainfall. This approximates a 3 year rainfall event for the New Orleans area. Also, this pumping objective is for a normal lake stage and not for a SPH event which has a recurrence interval of about once in 300 years. The management of storm drainage is entirely SWBNO's responsibility. Consequently the focus of plan formulation process was centered around alternatives which appear cost-effective from a hurricane protection standpoint while offering optimum physical conditions for an efficient operation of the existing pumping station during hurricane event. Development of such an alternative became more desirable when SWBNO expressed its strong opposition to any plan which calls for establishing a pre-agreed set of conditions for gate closure.

Based on the given set of constraints and associated costs, all alternatives involving channel or pumping station improvements become relatively less feasible. The project plan detailed in Section 33 best meets the objectives of flood protection for the Orleans Avenue Outfall Canal.

60. Need for Further Investigations.

The concept of the butterfly control valve-type gated structure, as recommended in the project plan, was model-tested at the Waterways Experiment Station at Vicksburg, Mississippi. A 1:20 scale physical model of the London Avenue Outfall Canal was built and channel geometry modified to achieve acceptable hydraulic performance. It was observed that a uniform approach flow was necessary for the flow-induced opening and closing of the gates. The designed gates performed satisfactorily under the anticipated flow conditions for the specific London Avenue Canal site geometry. Although the hydraulic conditions of the Orleans Avenue Outfall Canal are similar to the modeled London Avenue Canal, further model studies will be necessary to validate the torque forces required for the detailed design in sizing various components of the structure, as well as to ascertain the reliability of the flow-induced opening and closing operations under a wide range of hydraulic conditions.

ESTIMATE OF COST

61. General. Based on October 1988 price levels, the estimate first cost for constructing the Orleans Outfall Canal Butterfly Valve Control Structure plan is $9,110,000 of this cost $7,180,000 is for levees and floodwalls feature $862,000 for Engineering and Design and $804,000 for Supervision and Administration. These cost include such cost for inhouse work to prepare this report and prior reports. Table 11 presents the itemized first cost for the butterfly control valve plan.

TABLE 10
ESTIMATE OF FIRST COST
(OCT 88 PRICE LEVELS)
ORLEANS AVENUE OUTFALL CANAL
BUTTERFLY CONTROL VALVE STRUCTURE

Cost Acct No.	Item	Description	Quantity	Unit	Unit Price	Amount
11	A	***CONTROL STRUCTURE***				
		Embankment-semicompacted	3,000.0	CY	13.00	$ 39,000
		Structural Excavation	14,000.0	CY	9.00	126,000
		Structural Backfill	500.0	CY	13.00	6,500
		Shell Fill, 6" Thick	103.0	CY	18.00	1,854
		PMA-22 Steel Sheet Piling (128' X 15')	1,920.0	SF	10.00	19,200
		14" X 14" Concrete Piling (444' X 50')	22,000.0	LF	20.00	444,000
		Concrete Stab. Slab, 4"	69.0	CY	100.00	6,900
		Reinf. Concrete Base Slab	722.0	CY	200.00	144,400
		Wall	500.0	CY	350.00	175,000
		Machinery House	275.0	CY	400.00	110,000
		Needle Girder and Support	LS	LS	20,000.00	20,000
		Concrete Needles	LS	LS	60,000.00	60,000
		SUBTOTAL-CONTROL STRUCTURE				$1,152,854
	B	*STEEL BUTTERFLY GATES(4)*				
		Structural Steel	176,000.0	LB	1.50	$264,000
		Electrical	LS	LS	200,000.00	200,000
		Mechanical	LS	LS	250,000.00	250,000
		SUBTOTAL-BUTTERFLY GATES				$714,000
	C	***CONCRETE APRONS***				
		Shell Fill, 6" Thick	120.0	CY	18.00	$ 2,160
		12" Dia., Untreated Timber Piles, 220 X 25'	5,500.0	LF	9.00	49,500
		PMA-22 Steel Sheet Piling 256' X 12'	3,072.0	SF	10.00	30,720
		Concrete Stab. Slab, 4"	80.0	CY	100.00	8,000
		Reinf. Concrete, Base Slab	600.0	CY	200.00	120,000
		Walls	228.0	CY	350.00	79,800
		SUBTOTAL-CONCRETE APRONS				$290,180

TABLE 10 (Cont'd)
ESTIMATE OF FIRST COST
(OCT 88 PRICE LEVELS)
ORLEANS AVENUE OUTFALL CANAL
BUTTERFLY CONTROL VALVE STRUCTURE

Cost Acct No.	Item	Description	Quantity	Unit	Unit Price	Amount
	D	***APPROACH GUIDEWALLS***				
		PZ-35 Steel Sheet Piling 200' X 40'	8,000.0	SF	16.50	$132,000
		Concrete Cap, 2' X 6'	90.0	CY	350.00	31,500
		SUBTOTAL-APPROACH GUIDEWALL				$163,500
			Subtotal-A+B+C+D			$2,320,534
11	E	***EROSION PROTECTION***				
		Shell, 6" Thick	50.0	CY	18.00	$ 900
		Riprap, 12"	150.0	TON	20.00	3,000
		SUBTOTAL-EROSION PROTECTION				$ 3,900
	F	*****COFFERDAM****				
		Pz-27 Steel Sheet Piling 51' X 590'	30,090.0	SF	12.50	$ 376,125
		14" Steel H-Piling (HP14X73) 60 X 160'	9,600.0	LH	24.00	230,400
		18" Waler, W18X76	590.0	LF	35.00	20,650
		Removal of Cofferdam	LS	LS	100,000.00	100,000
		Dewatering	LS	LS	300,000.00	300,000
		Pile Test	2	EA	20,000.00	40,000
		SUBTOTAL-COFFERDAM				$1,076,175
	G	***CHANNEL CLOSURE***				
		Shell Fill, 180' X 54	9,720.0	CY	18.00	$ 174,960
		PZ-35 Steel Sheet Piling 207' X 33.5'	6,940.0	SF	16.50	114,510
		Concrete Cap, 2'X9X207'	138.0	CY	350.00	48,300
		Riprap (Lakeside only)	460.0	TON	20.00	9,200
		SUBTOTAL-CHANNEL CLOSURE				$346,970
	H	****CHANNEL EXCAVATION****	30,000.0	CY	9.00	$ 270,000

TABLE 10 (Cont'd)
ESTIMATE OF FIRST COST
(OCT 88 PRICE LEVELS)
ORLEANS AVENUE OUTFALL CANAL
BUTTERFLY CONTROL VALVE STRUCTURE

Cost Acct No.	Item	Description	Quantity	Unit	Unit Price	Amount
	I	***LEVEE AND FLOODWALL***				
		PSA-23 Steel Sheet Piling	480.0	SF	16.00	7,680
		PZ-35 Steel Sheet Piling	2,670.0	SF	16.50	44,055
		PZ-27 Steel Sheet Piling	69,600.0	SF	12.50	870,000
		Semi-compacted Fill	3,200.0	CY	13.00	41,600
		Fully-compacted Fill	600.0	CY	16.00	9,600
		Sand Fill	800.0	CY	16.00	12,800
		Concrete Cap	2,300.0	CY	300.00	690,000
		Clearing and Grubbing	8.0	AC	200.00	1,600
		Fertilizing and Seeding	8.0	AC	500.00	4,000
		SUBTOTAL-LEVEE & FLOODWALL				$1,681,335
			Subtotal-E+F+G+H+I			$3,369,380
11	J	*ENVIRONMENTAL PROTECTION*	LS	LS	5,000.00	$ 5,000
	K	****MOB & DEMOB****	LS	LS	50,000.00	50,000
		SUBTOTAL CONSTRUCTION COST				$5,744,914
		CONTINGENCIES (25%±)				1,436,229
11		TOTAL CONSTRUCTION COST (R)				7,182,000
30		E & D (12%±)				859,000
		SUBTOTAL				8,041,000
31		S & A (10%±)				804,000
		SUBTOTAL				8,845,000
30	L	WES MODEL STUDY	LS	LS	265,000.00	265,000
		**************************				***********
		TOTAL				$9,110,000

62. Comparison of Estimates. The current estimate of $9,110,000 for the high level plan Orleans Avenue Outfall Canal represents a decrease of $5,693,000 when compared to the current PB-3 estimate. Table 12 shows a comparison by cost account of the incremential cost required to construct the project plan recommended herein. The largest part of the decrease in cost is in the estimated cost for levees and floodwalls. This reduction in cost is primarily due to a refinement of the designs from a survey scope to a GDM scope. The PB-3 plan was based on fronting protection using a more conventional gate design and higher contingencies. The estimated cost for engineering and design contained in this GDM is based on estimates of cost needed to complete designs for the butterfly valve plan. It includes sunk cost; cost for model test; DDM cost; and P&S preparation costs. The estimate for supervision and administration cost is based on a percentage of the estimated construction cost. The percentage used is reflective of an average of actual S&A cost percentages experienced by the New Orleans District.

TABLE 11

COMPARISON OF ESTIMATES
(Incremental Costs)

Feature	PB-3 (eff. Oct 88)	GDM	Difference GDM & PB-3
	($)	($)	($)
11 Levees & Floodwalls	12,146,000	7,182,000	-4,964,000
30 Engineering & Design	1,457,000	1,124,000	-333,000
31 Supervision & Administration	1,200,000	804,000	-396,000
TOTAL PROJECT COST	$14,803,000	$9,110,000	-$5,693,000

SCHEDULE FOR DESIGN AND CONSTRUCTION

63. Schedule for Design and Construction. The recommended project plan contained herein has been developed and is presented as a basis for determining the Federal share to the contributed towards construction of the Parallel Protection Plan. Therefore, no schedule of design and construction for the butterfly valve plan will be presented. Instead, the Federal funding to be contributed for the construction of parallel protection is based on the current design and construction schedule that the Orleans Levee Board has developed. The current schedule for non-Federal funding is shown in Table 13.

FEDERAL AND NON-FEDERAL COST BREAKDOWN

64. Federal and Non-Federal Cost Breakdown. The breakdown of Federal and non-Federal costs needed to construct the butterfly valve plan described in the GDM is shown in Table 12 below:

TABLE 12

FEDERAL AND NON-FEDERAL COST BREAKDOWN
OCT 88 PRICE LEVELS

Item	Federal 1/ ($)	Non-Federal ($)	Total ($)
Fronting Protection & Levees	6,380,000	2,730,000	9,110,000

1/ Federal share to be contributed towards cost of Parallel Protection Plan.

65. Funds Required by Fiscal Year. To maintain the Orleans Levee Board schedule for design and construction of the Parallel Protection Plan, the Federal share of the funding as described in paragraph 58 has been prorated as a percentage of the total schedule parallel protection cost that is to be expended during the FY. Table 13 gives the estimated schedule of expenditures that OLB has programmed to construct the Parallel Protection Plan. The prorated Federal funds required to support the OLB program are also tabulated by FY in Table 13.

TABLE 13

FEDERAL & NON-FEDERAL FUNDS REQUIRED BY FISCAL YEAR

	Non-Federal	Federal
Sunk Cost Prior to FY 88	$ 933,715	$ 60,000
Funds Required FY 88	3,796,863	210,000
Funds Required FY 89	12,507,540	3,500,000
Funds Required FY 90	8,643,034	2,610,000
TOTAL	$25,881,152 1/	$6,380,000

1/ Does not include cost for Real Estate Acquisition.

OPERATION AND MAINTENANCE

66. General. The Orleans Avenue Outfall Canal butterfly control valve plan would be operated at the expense of the local interests. The estimate of the annual operation and maintenance costs for the control structure and appurtenant levees and floodwalls which are detailed in the GDM are as follows:

Maintenance & replacement of machinery	$ 4,800
Three-time major replacement of gates @ Year 50	5,400
TOTAL ANNUALIZED COST	$10,200

ECONOMICS

67. Economic Justification.

The current economic analysis for the entire Lake Pontchartrain, Louisiana and Vicinity Hurricane Protection Project is contained in the Reevaluation Study entitled "Lake Pontchartrain, Louisiana and Vicinity Hurricane Protection Project," dated December 1983. Based on October 1981 price levels, and the project interest rate of 3 1/8 percent, the benefit-cost ratio for the project as a whole was 4.2 to 1. The project is currently under construction and a remaining benefit-remaining cost ratio at the project interest rate is 9.9 to 1 and at the current Federal discount rate is 5.0 to 1. The Reevaluation Study also broke out separable project areas (SPA) for incremental justification. The Orleans Outfall Canal reach is a part of the New Orleans-Jefferson SPA. The computed benefit-cost ratio for the New Orleans-Jefferson area was 5.0 to 1 in the 1984 Reevaluation Study. Updating this SPA for price levels and interest rates produces a remaining benefit to remaining cost ratio of 6.0 to 1 at the project interest rate and 1.6 to 1 at the current Federal interest rate.

68. Recommendations. It is recommended that the project plan detailed herein (butterfly valve plan) be approved as the recommended Federal plan. It has been shown to be the most economical plan which fully satisfies the mandate of the project authorization. When compared to the parallel protection plan, it is approximately 5 times less costly. Also, the butterfly valve plan fully accommodates existing and future interior drainage requirements for the City of New Orleans. Because the Orleans Levee Board is actively preparing designs and plans to construct parallel protection and has also budgeted funds for said purpose, the

need for the fronting protection butterfly valve plan will be eliminated. It is therefore recommended that the butterfly valve plan be used to establish the limits on Federal cost sharing to be applied to the cost of parallel protection.

LAKE PONTCHARTRAIN, LA. AND VICINITY
HIGH LEVEL PLAN
DESIGN MEMORANDUM NO. 19
GENERAL DESIGN
ORLEANS AVE. OUTFALL CANAL
INDEX AND VICINITY MAP
U. S. ARMY ENGINEER DISTRICT, NEW ORLEANS
CORPS OF ENGINEERS
DATE AUG. 1988 FILE NO. H-2- 30290

PLATE 1

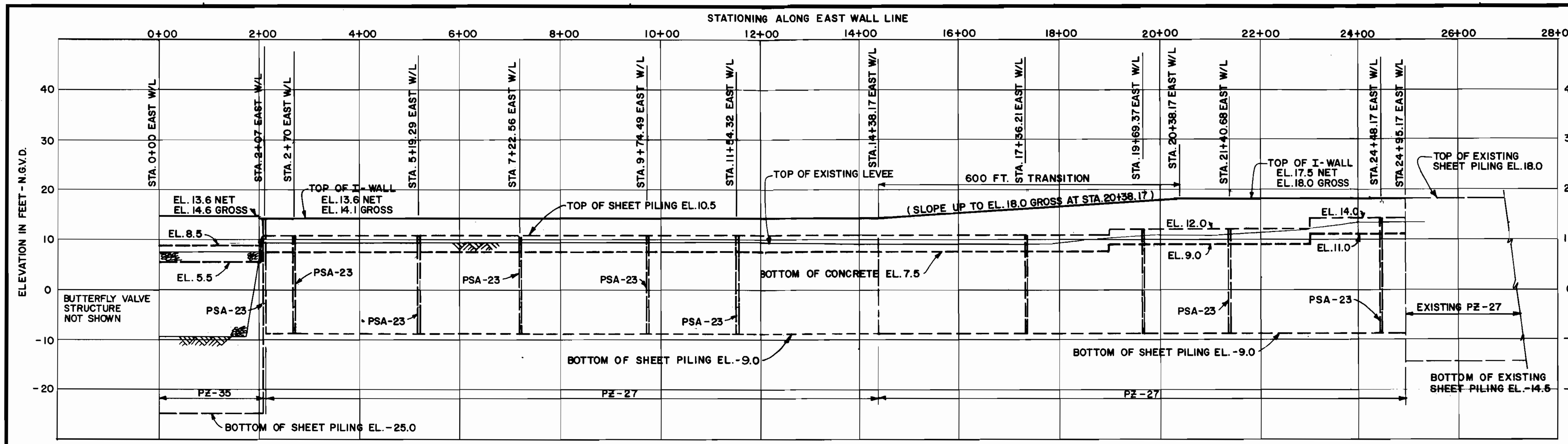
LAKE PONTCHARTRAIN, LA. AND VICINITY
HIGH LEVEL PLAN
DESIGN MEMORANDUM NO. 19 - GENERAL DESIGN
ORLEANS AVE. OUTFALL CANAL

PLAN

U. S. ARMY ENGINEER DISTRICT, NEW ORLEANS
CORPS OF ENGINEERS

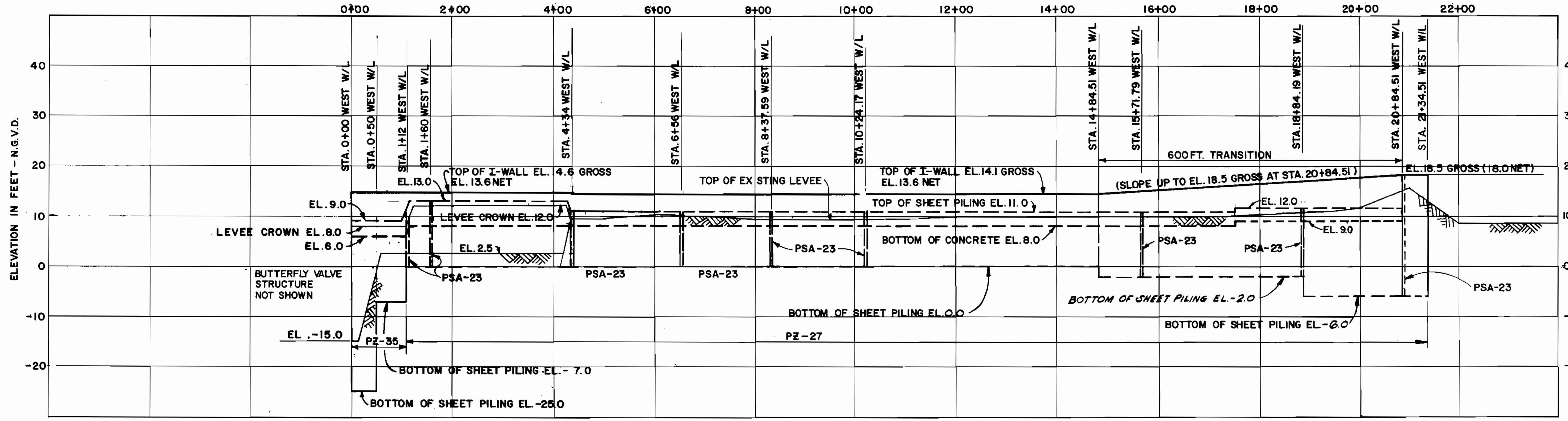
DATE AUG. 1988 FILE NO. H-2-39290

PLATE 2



EAST PROFILE

SCALE: HOR. 1" = 100' VERT. 1" = 10'



WEST PROFILE

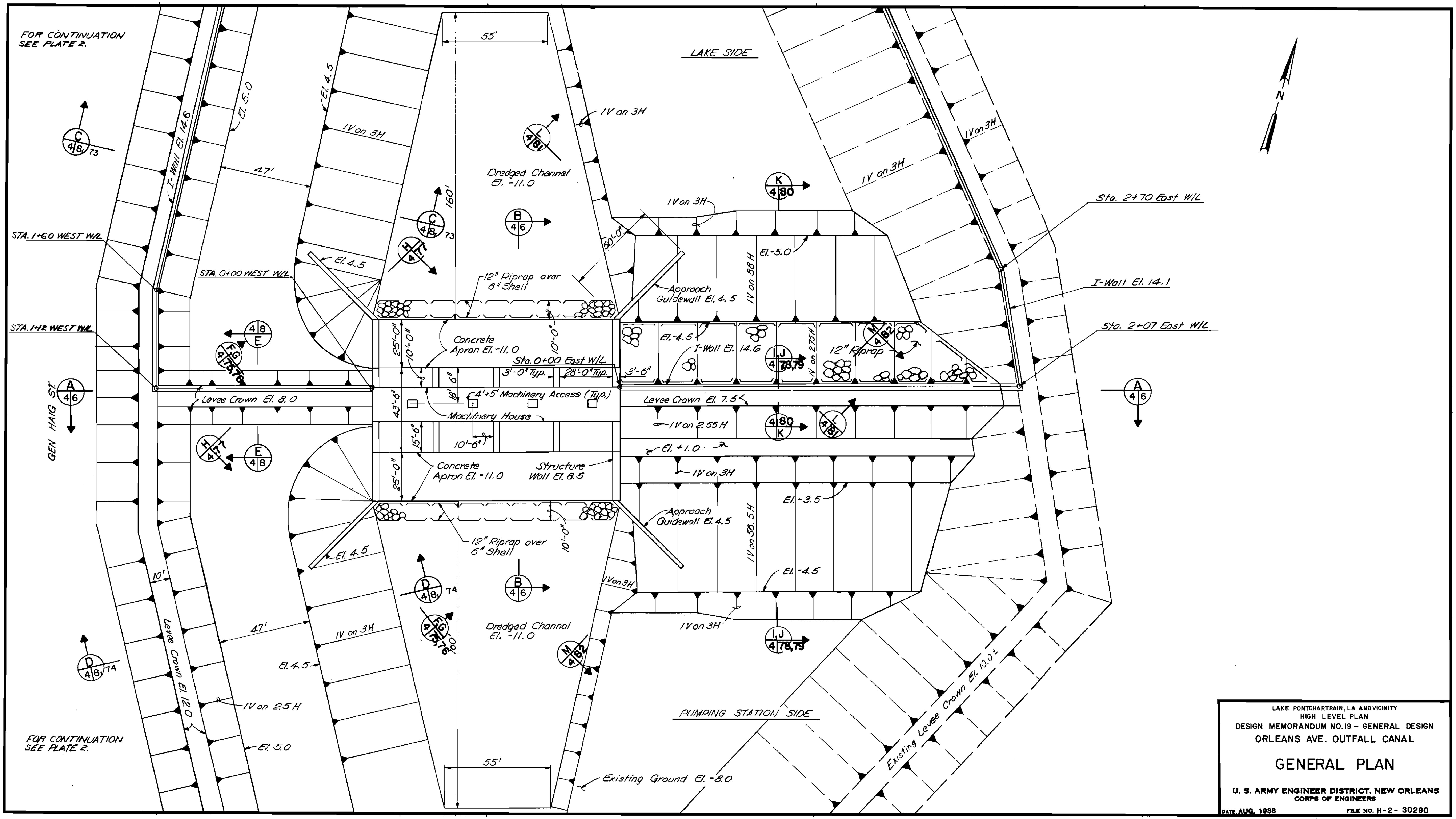
SCALE: HOR. 1" = 100' VERT. 1" = 10'

LAKE PONTCHARTRAIN, LA. AND VICINITY
HIGH LEVEL PLAN
DESIGN MEMORANDUM NO. 19 - GENERAL DESIGN
ORLEANS AVE. OUTFALL CANAL

PROFILE

U. S. ARMY ENGINEER DISTRICT, NEW ORLEANS
CORPS OF ENGINEERS

DATE AUG. 1988 FILE NO. H-2-30290



LAKE PONTCHARTRAIN, LA. AND VICINITY
HIGH LEVEL PLAN
DESIGN MEMORANDUM NO. 19 – GENERAL DESIGN
ORLEANS AVE. OUTFALL CANAL

GENERAL PLAN

U. S. ARMY ENGINEER DISTRICT, NEW ORLEANS
CORPS OF ENGINEERS

DATE AUG. 1988 FILE NO. H-2- 30290

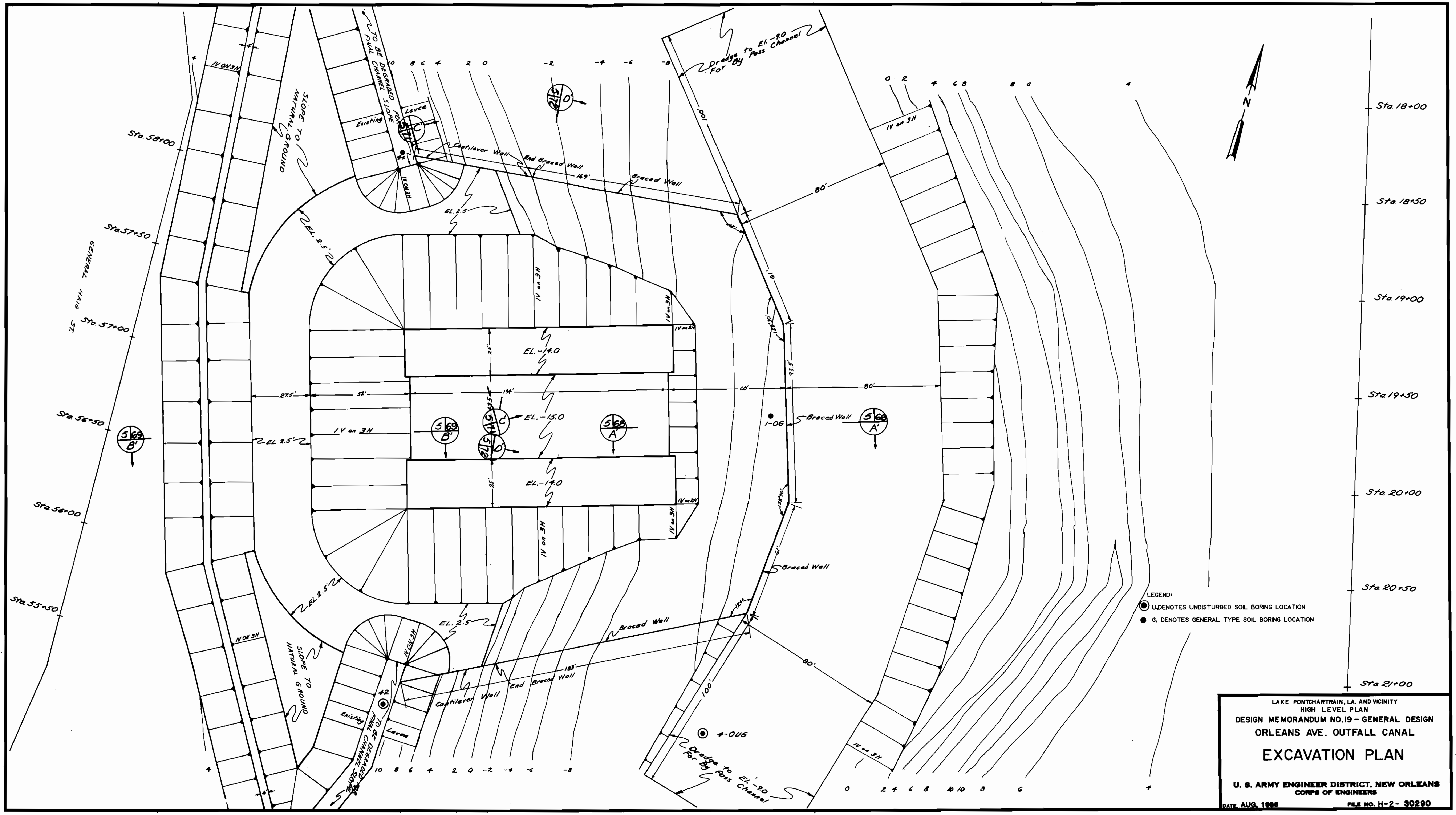
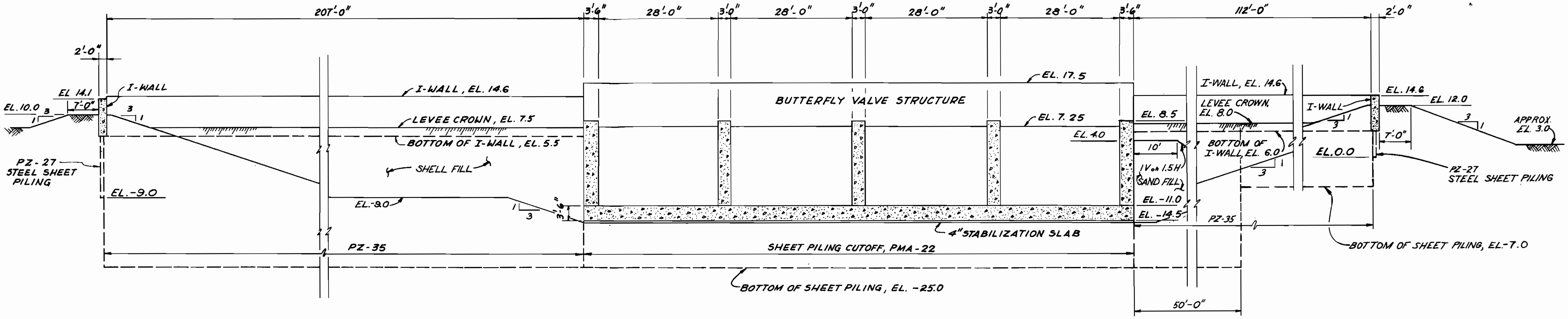
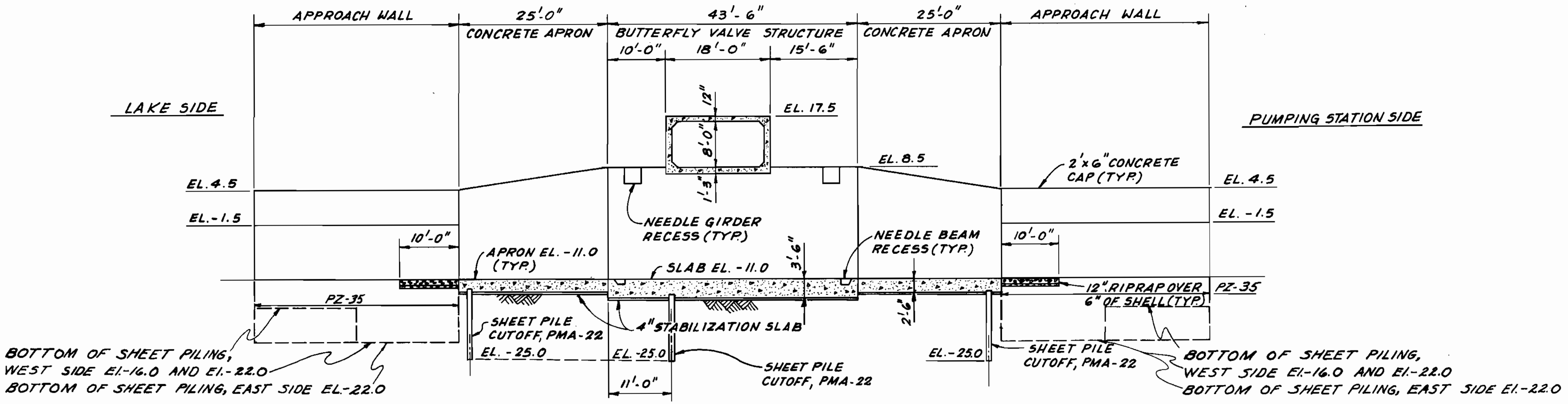

Sta. 58+00
Sta. 57+50
Sta. 57+00
Sta. 56+50
Sta. 56+00
Sta. 55+50
GENERAL HAIG ST.
Sta. 18+00
Sta. 18+50
Sta. 19+00
Sta. 19+50
Sta. 20+00
Sta. 20+50
Sta. 21+00
SLOPE TO NATURAL GROUND
TO BE DEGRADED FOR FINAL CHANNEL SLOPE
Existing Levee
1V ON 3H
Cantilever Wall
End Braced Wall
Braced Wall
169'
185'
80'
60'
100'
Dredge to El. -90 For By Pass Channel
EL. 2.5
EL. 2.5'
EL. -14.0
EL. -15.0
134'
52'
27.5'
25'
1V on 2H
1-0G
4-0UG
42
LEGEND:
U, DENOTES UNDISTURBED SOIL BORING LOCATION
G, DENOTES GENERAL TYPE SOIL BORING LOCATION
N
LAKE PONTCHARTRAIN, LA. AND VICINITY
HIGH LEVEL PLAN
DESIGN MEMORANDUM NO. 19 – GENERAL DESIGN
ORLEANS AVE. OUTFALL CANAL
EXCAVATION PLAN
U. S. ARMY ENGINEER DISTRICT, NEW ORLEANS
CORPS OF ENGINEERS
DATE AUG. 1968
FILE NO. H-2- 30290

PLATE 5



SECTION A/46



SECTION B/46

SCALE: 1" = 10'

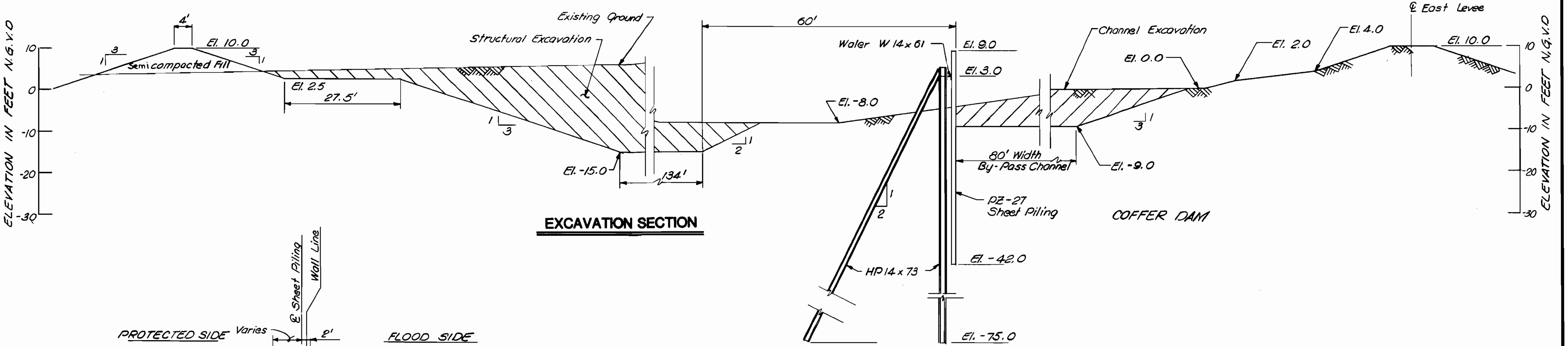
10' 0 10' 20' 30'

LAKE PONTCHARTRAIN, LA. AND VICINITY
HIGH LEVEL PLAN
DESIGN MEMORANDUM NO. 19 - GENERAL DESIGN
ORLEANS AVE. OUTFALL CANAL

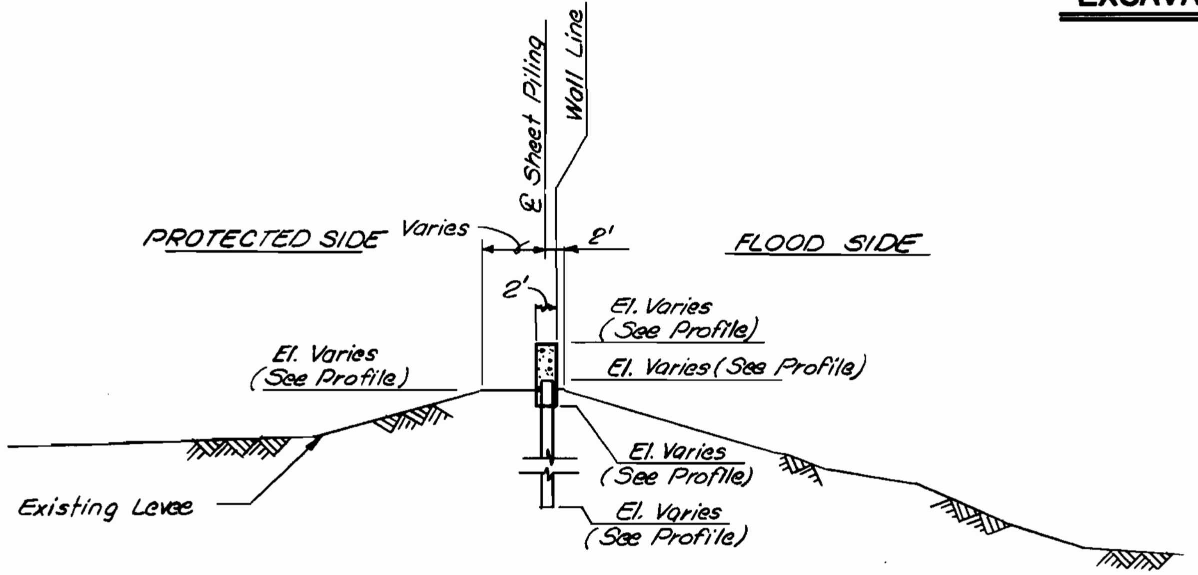
TYPICAL SECTIONS

U. S. ARMY ENGINEER DISTRICT, NEW ORLEANS
CORPS OF ENGINEERS

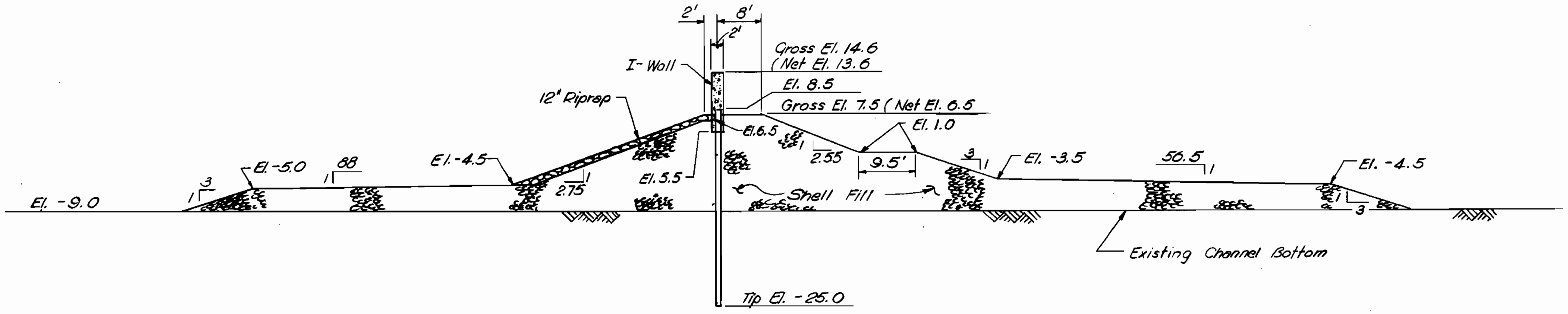
DATE AUG. 1968 FILE NO. H-2-30290



EXCAVATION SECTION



TYPICAL I-WALL SECTION



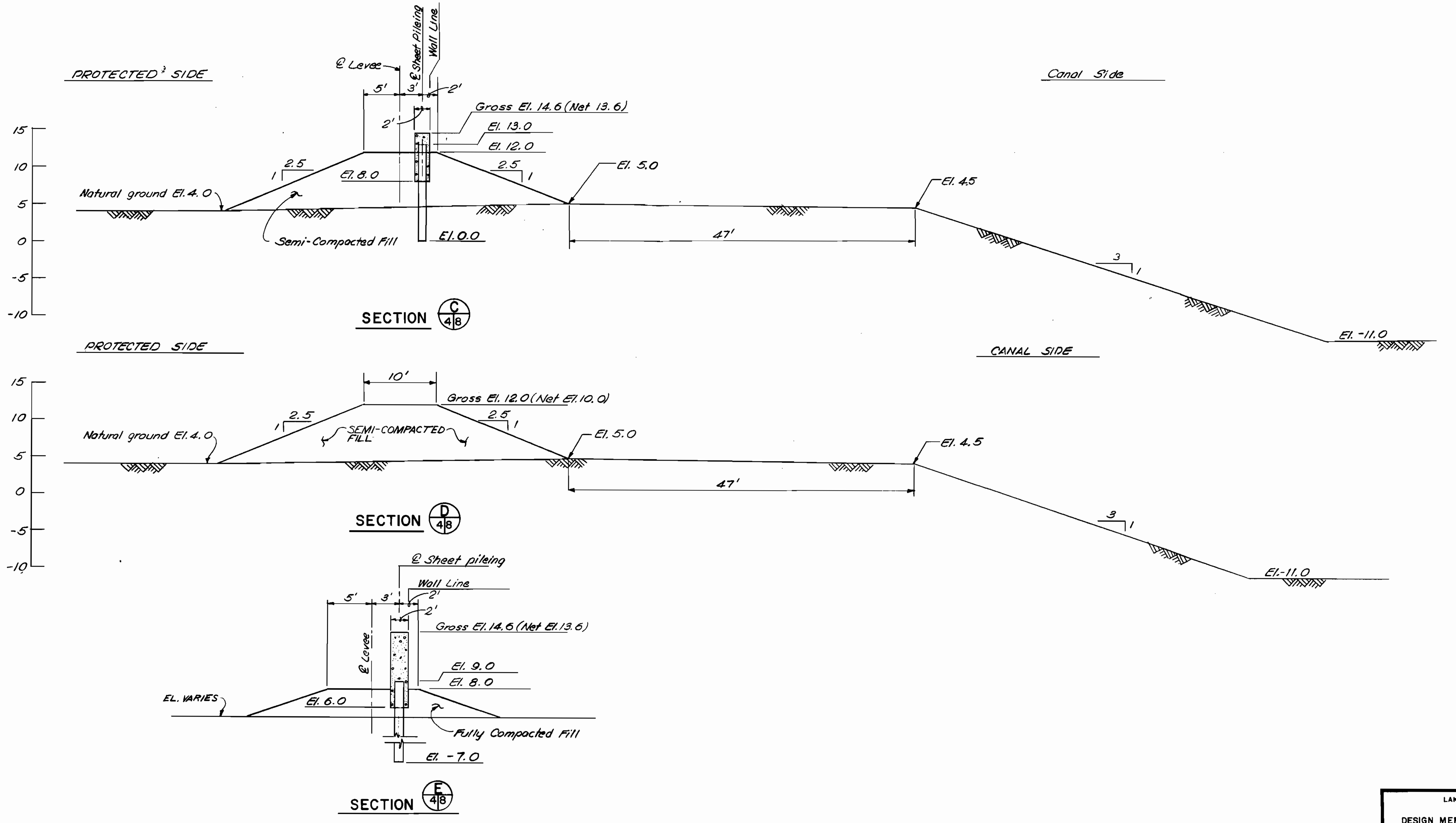
CHANNEL CLOSURE SECTION

LAKE PONTCHARTRAIN, LA. AND VICINITY
HIGH LEVEL PLAN
DESIGN MEMORANDUM NO.19-GENERAL DESIGN
ORLEANS AVE. OUTFALL CANAL

TYPICAL SECTIONS

U. S. ARMY ENGINEER DISTRICT, NEW ORLEANS
CORPS OF ENGINEERS

DATE AUG. 19[illegible] FILE NO. H-2-[illegible]

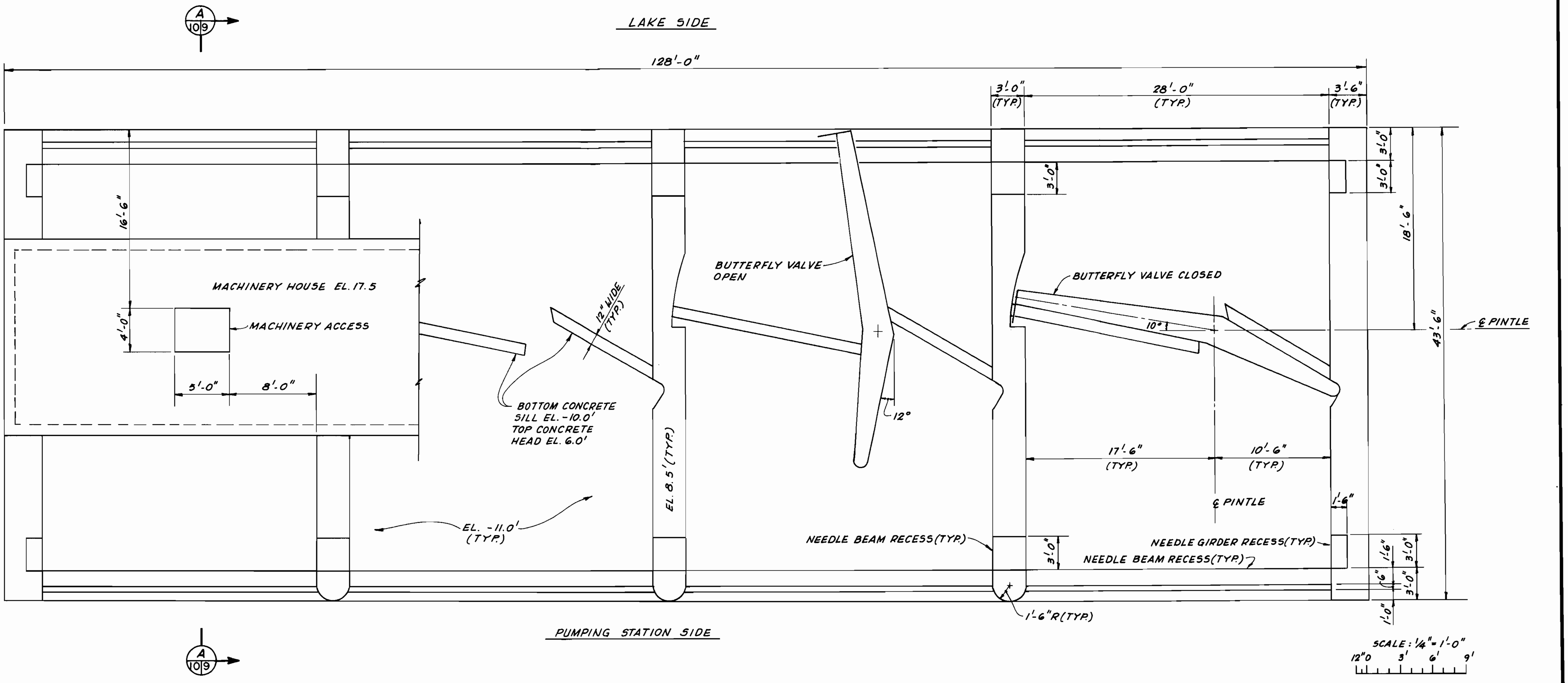


LAKE PONTCHARTRAIN, LA. AND VICINITY
HIGH LEVEL PLAN
DESIGN MEMORANDUM NO. 19 - GENERAL DESIGN
ORLEANS AVE. OUTFALL CANAL

TYPICAL SECTIONS

U. S. ARMY ENGINEER DISTRICT, NEW ORLEANS
CORPS OF ENGINEERS

DATE AUG. 1966 FILE NO. H-2-30290



PLAN

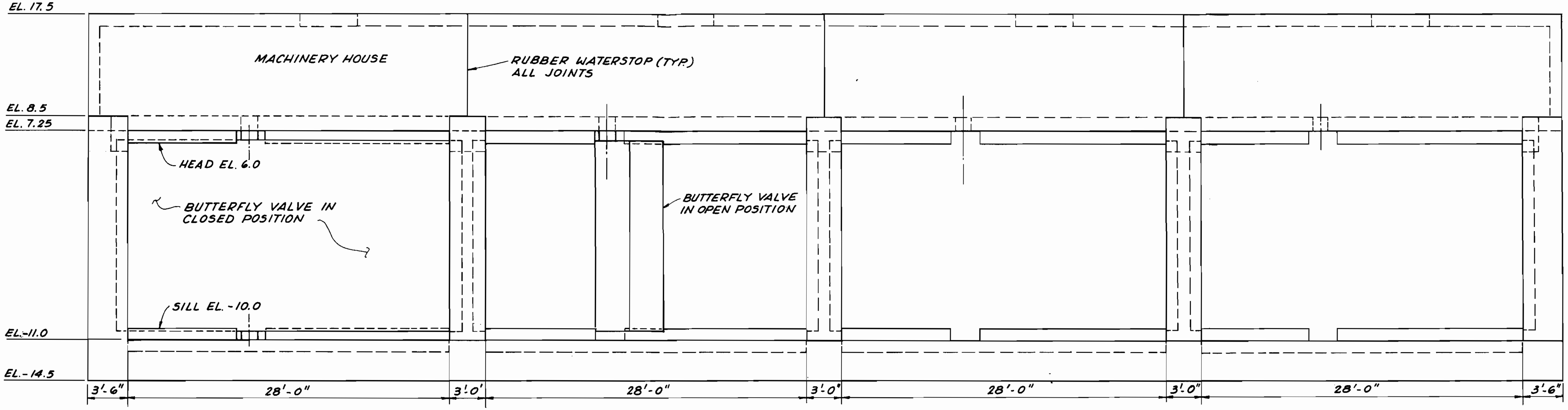
BUTTERFLY VALVE STRUCTURE

LAKE PONTCHARTRAIN, LA. AND VICINITY
HIGH LEVEL PLAN
DESIGN MEMORANDUM NO. 19-- GENERAL DESIGN
ORLEANS AVE. OUTFALL CANAL

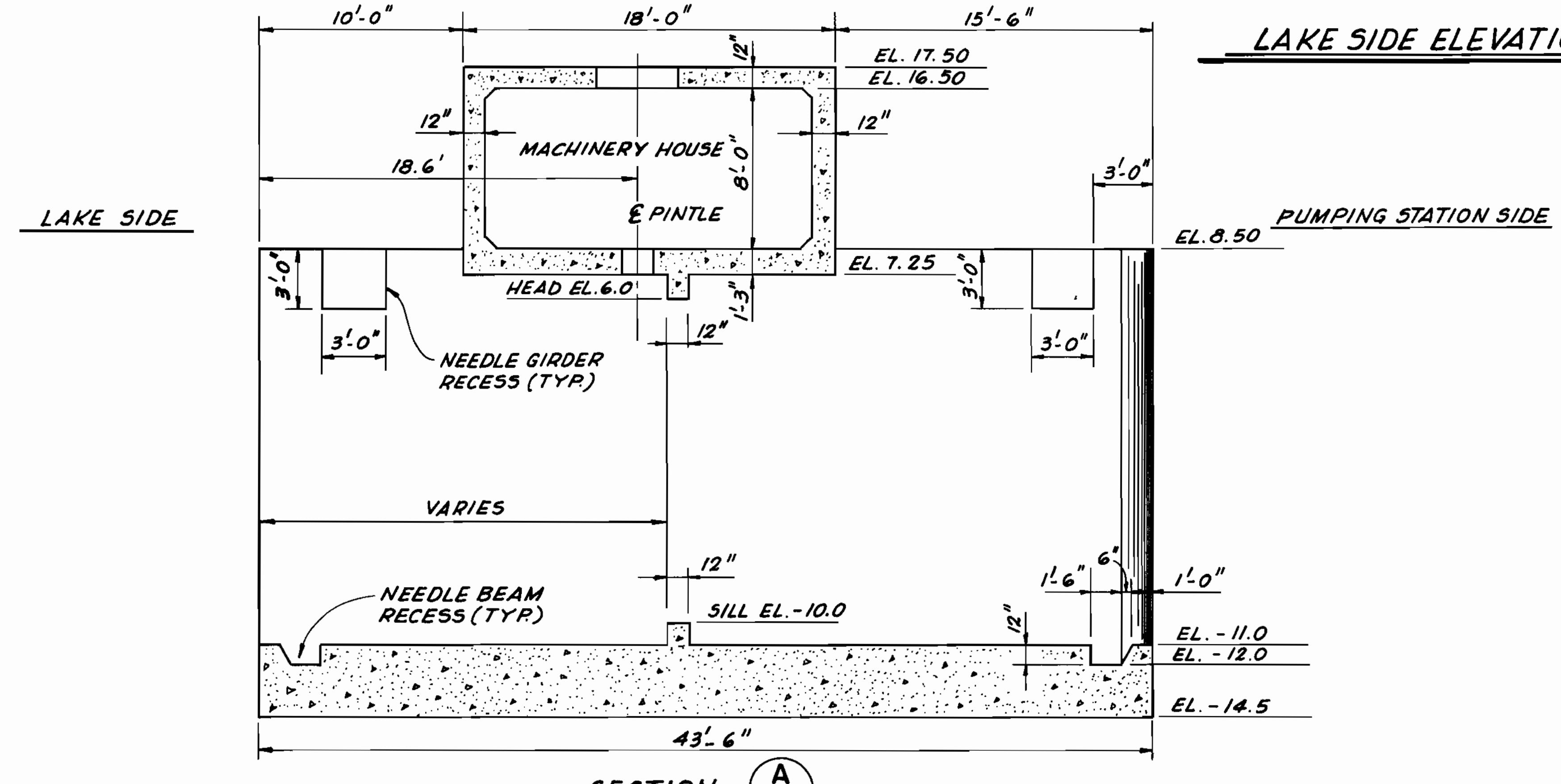
BUTTERFLY VALVE STRUCTURE

U. S. ARMY ENGINEER DISTRICT, NEW ORLEANS
CORPS OF ENGINEERS

DATE AUG. 1988 FILE NO. H-2- 30290



LAKE SIDE ELEVATION



SECTION A 10 9

SCALE: 1/4" = 1'-0"
12" 0 3' 6' 9'

LAKE PONTCHARTRAIN, LA. AND VICINITY
HIGH LEVEL PLAN
DESIGN MEMORANDUM NO. 19 - GENERAL DESIGN
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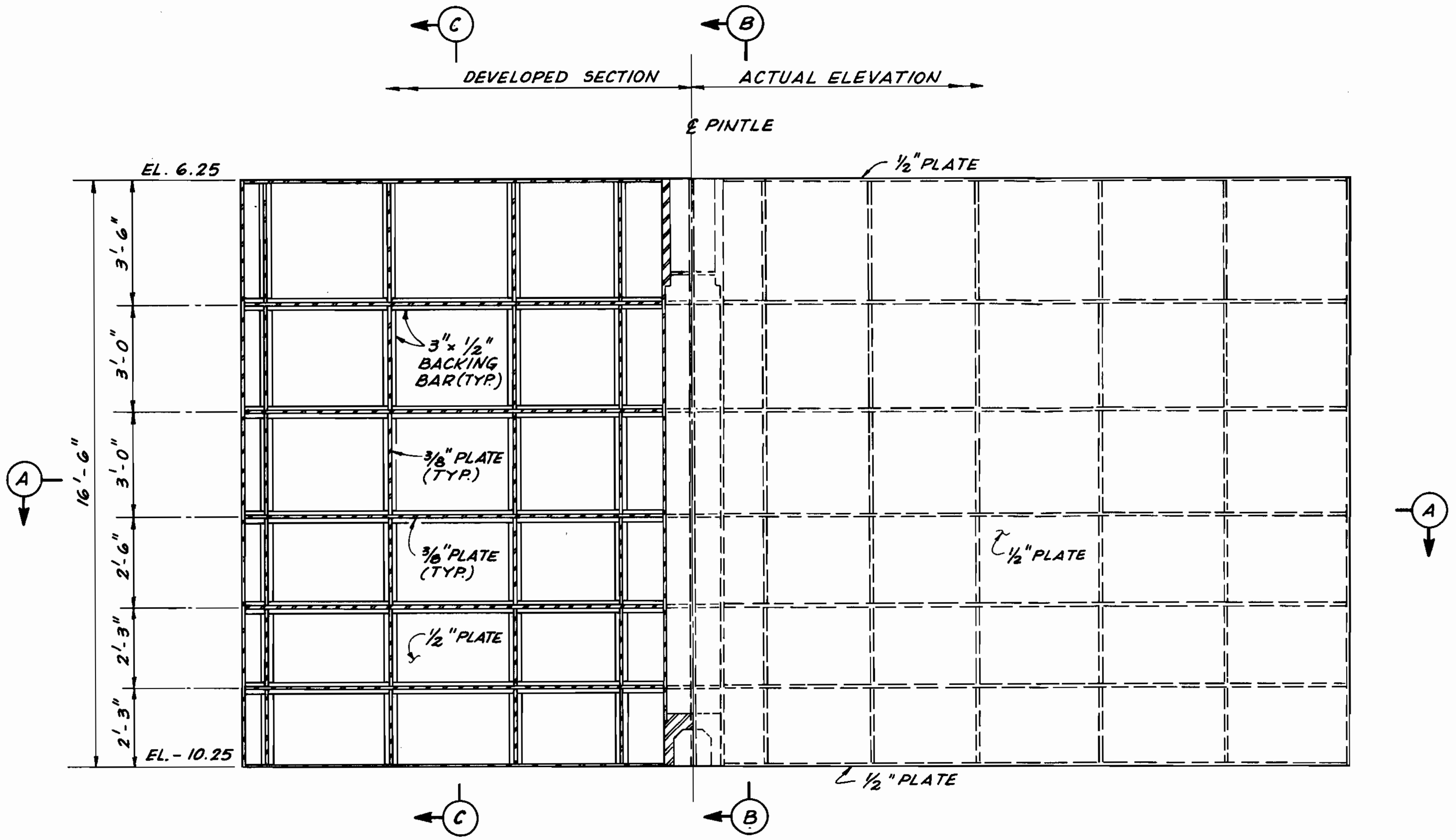
ELEVATION AND SECTION

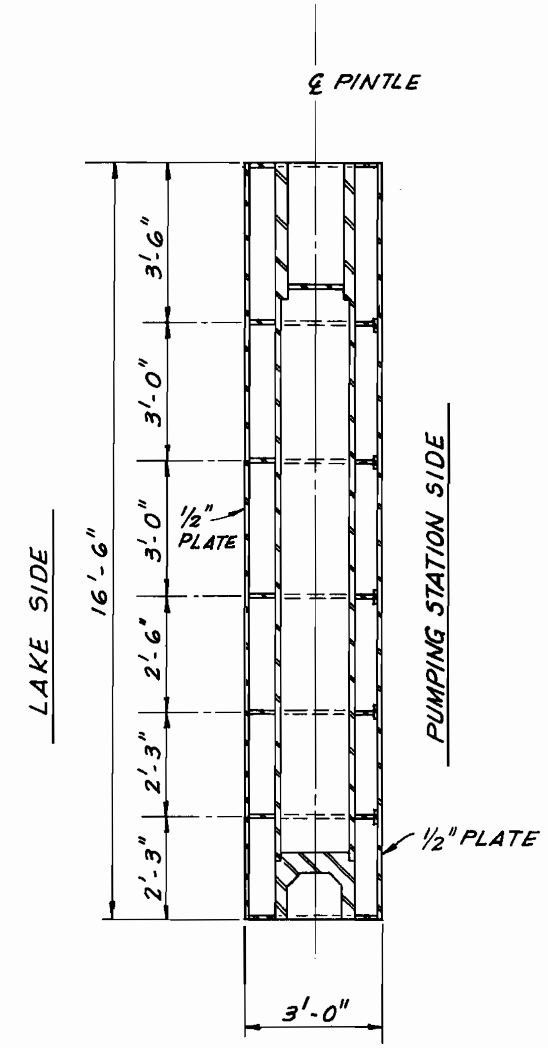
U. S. ARMY ENGINEER DISTRICT, NEW ORLEANS
CORPS OF ENGINEERS

DATE AUG. 1988 FILE NO. H-2- 30290

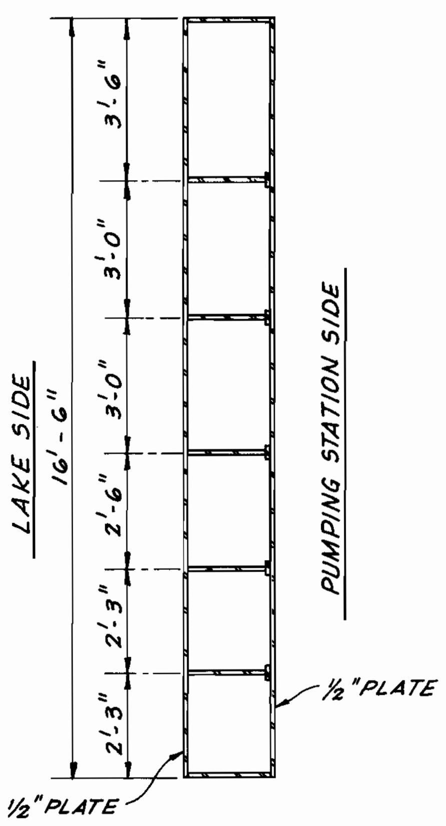
PLATE 10



HALF SECTION/HALF ELEVATION (LAKE SIDE)

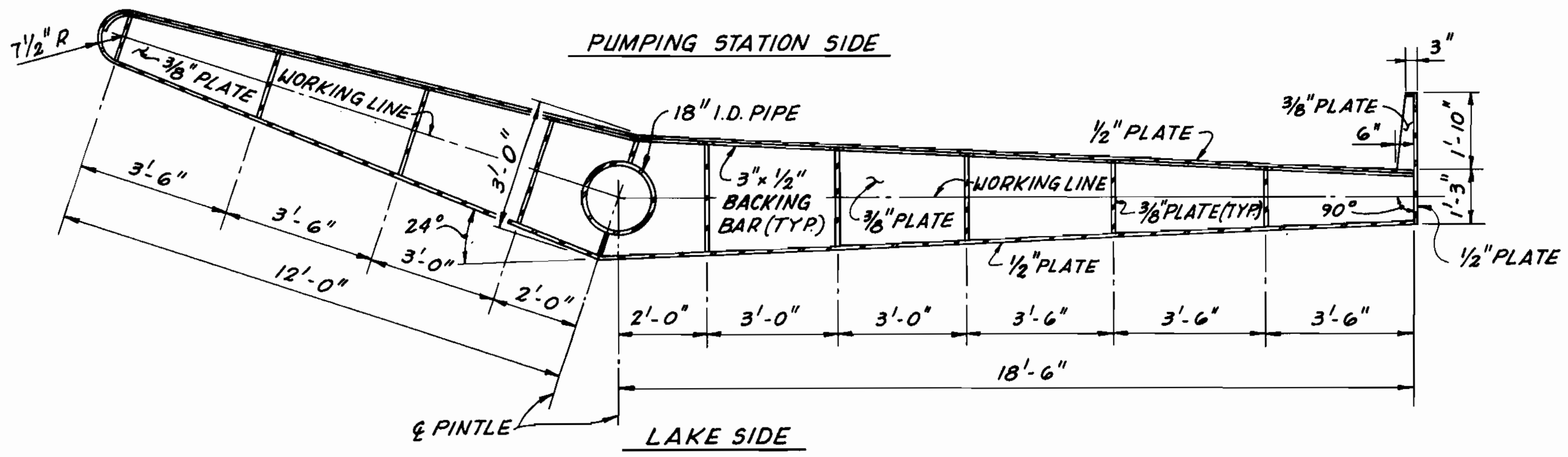


SECTION (B)



SECTION (C)

SCALE: ½" = 1'-0"



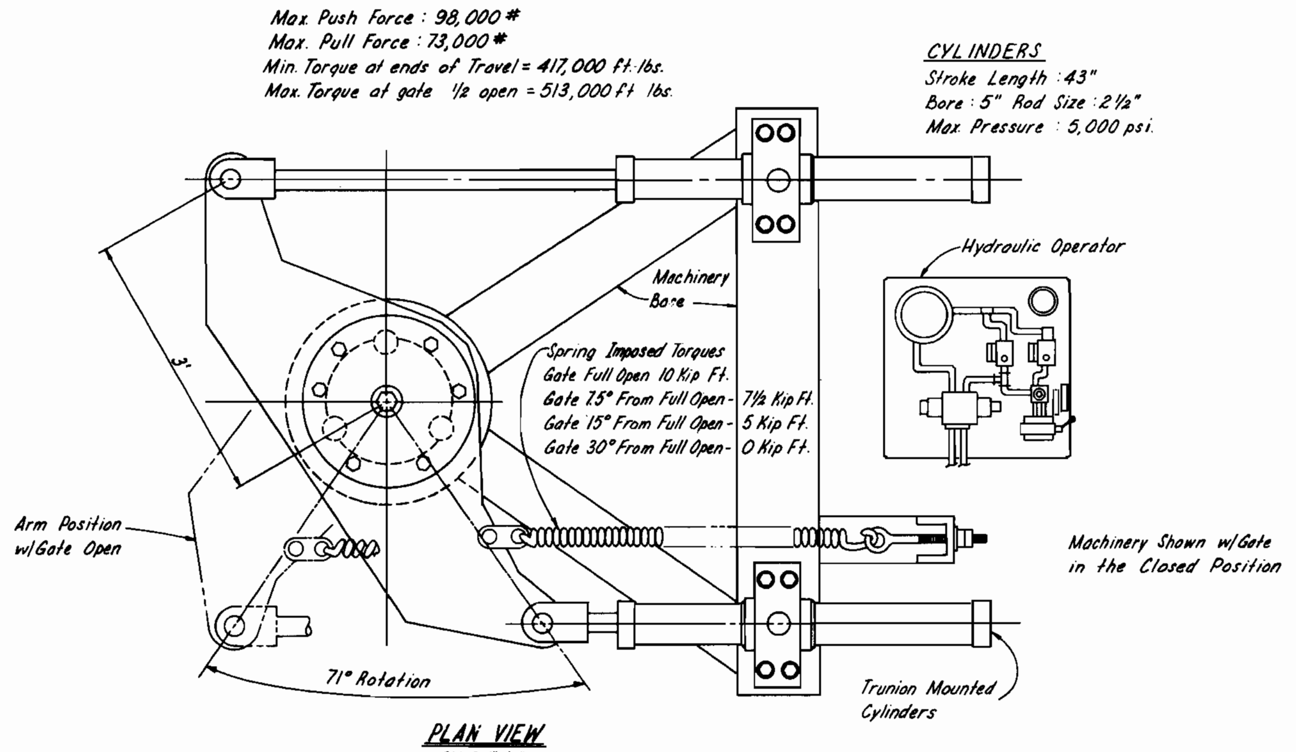
SECTION (A)

LAKE PONTCHARTRAIN, LA. AND VICINITY
HIGH LEVEL PLAN
DESIGN MEMORANDUM NO. 19 - GENERAL PLAN
ORLEANS AVE. OUTFALL CANAL

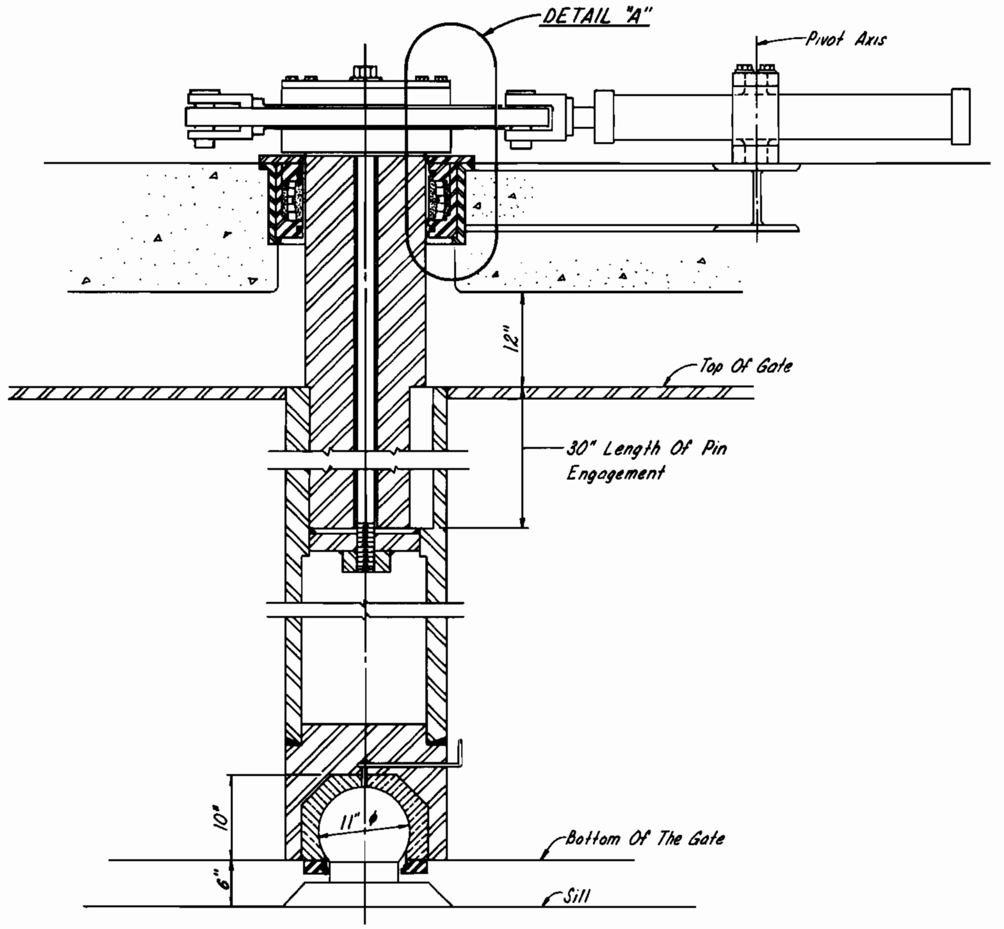
BUTTERFLY VALVE

U. S. ARMY ENGINEER DISTRICT, NEW ORLEANS
CORPS OF ENGINEERS

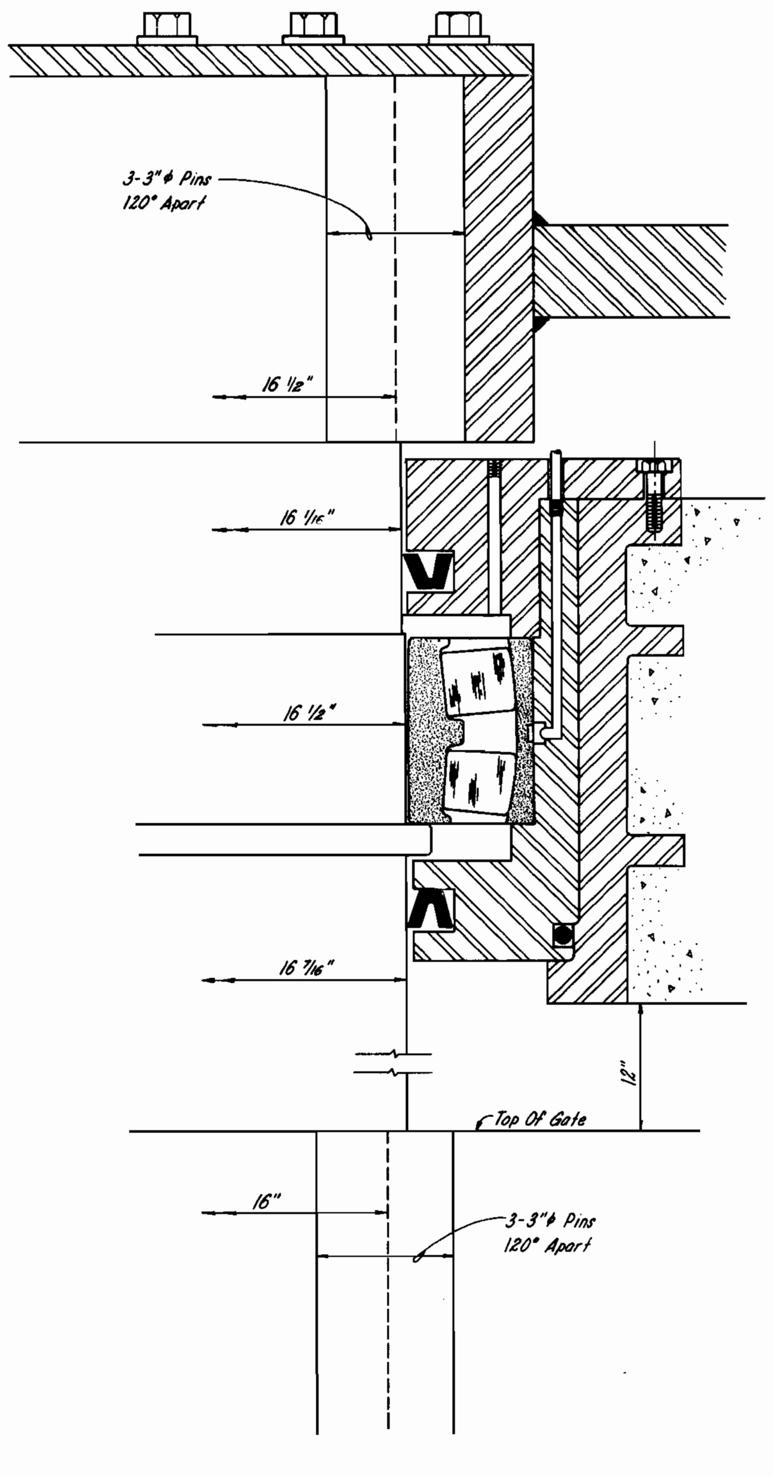
DATE AUG. 1968 FILE NO. H-2- 30290



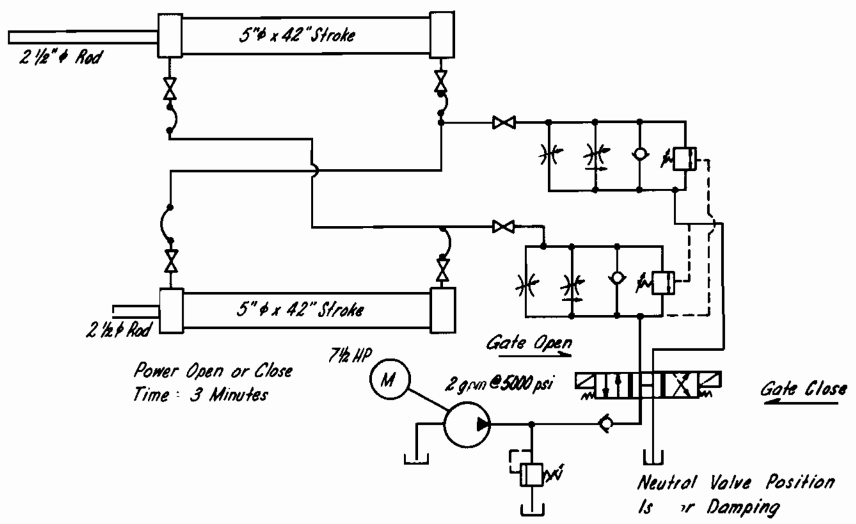
PLAN VIEW
SCALE: 1"=1'-0"



SECTION ELEVATION
SCALE: 1"=1'-0"



DETAIL "A"
UPPER BRG. ASSEMBLY



HYDRAULIC SCHEMATIC

LAKE PONTCHARTRAIN, LA. AND VICINITY
HIGH LEVEL PLAN
DESIGN MEMORANDUM NO. 19 - GENERAL DESIGN
ORLEANS AVE. OUTFALL CANAL

MACHINERY LAYOUT

U. S. ARMY ENGINEER DISTRICT, NEW ORLEANS
CORPS OF ENGINEERS

DATE AUG. 1988 FILE NO. H-2-30290

PLATE 12

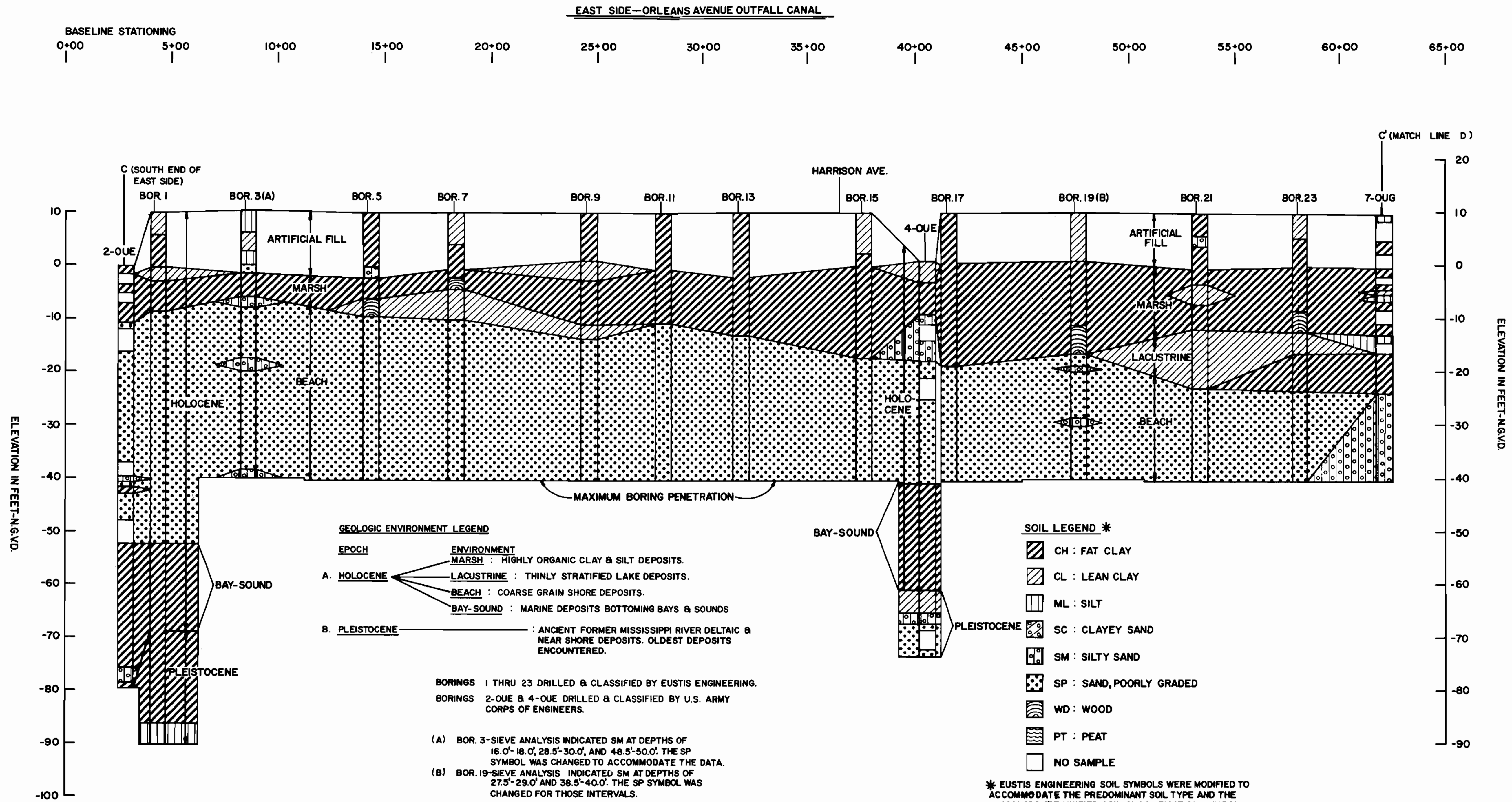
SEE LEGEND PLATE 5

LAKE PONTCHARTRAIN, LA. AND VICINITY
HIGH LEVEL PLAN
DESIGN MEMORANDUM NO. 19 – GENERAL DESIGN
ORLEANS AVE. OUTFALL CANAL

ALTERNATIVE ALIGNMENT PARALLEL PROTECTION

U. S. ARMY ENGINEER DISTRICT, NEW ORLEANS
CORPS OF ENGINEERS
DATE AUG. 1988 FILE NO. H-2- 40290

PLATE 12A



GEOLOGIC ENVIRONMENT LEGEND

EPOCH	ENVIRONMENT
A. HOLOCENE	MARSH : HIGHLY ORGANIC CLAY & SILT DEPOSITS.
	LACUSTRINE : THINLY STRATIFIED LAKE DEPOSITS.
	BEACH : COARSE GRAIN SHORE DEPOSITS.
	BAY-SOUND : MARINE DEPOSITS BOTTOMING BAYS & SOUNDS
B. PLEISTOCENE	: ANCIENT FORMER MISSISSIPPI RIVER DELTAIC & NEAR SHORE DEPOSITS. OLDEST DEPOSITS ENCOUNTERED.

BORINGS 1 THRU 23 DRILLED & CLASSIFIED BY EUSTIS ENGINEERING.

BORINGS 2-OUE & 4-OUE DRILLED & CLASSIFIED BY U.S. ARMY CORPS OF ENGINEERS.

(A) BOR. 3-SIEVE ANALYSIS INDICATED SM AT DEPTHS OF 16.0'- 18.0', 28.5'-30.0', AND 48.5'-50.0'. THE SP SYMBOL WAS CHANGED TO ACCOMMODATE THE DATA.

(B) BOR. 19-SIEVE ANALYSIS INDICATED SM AT DEPTHS OF 27.5'-29.0' AND 38.5'-40.0'. THE SP SYMBOL WAS CHANGED FOR THOSE INTERVALS.

BORING 7-OUG DRILLED BY EUSTIS ENGINEERING & CLASSIFIED BY U.S. ARMY CORPS OF ENGINEERS.

SEE FIG. 1 APPENDIX A FOR LOCATION OF EUSTIS ENGINEERING BORINGS

SOIL LEGEND *

- CH : FAT CLAY
- CL : LEAN CLAY
- ML : SILT
- SC : CLAYEY SAND
- SM : SILTY SAND
- SP : SAND, POORLY GRADED
- WD : WOOD
- PT : PEAT
- NO SAMPLE

* EUSTIS ENGINEERING SOIL SYMBOLS WERE MODIFIED TO ACCOMMODATE THE PREDOMINANT SOIL TYPE AND THE APPROPRIATE UNIFIED SOIL CLASSIFICATION SYMBOL.

HORIZONTAL SCALE : 1"= 250'

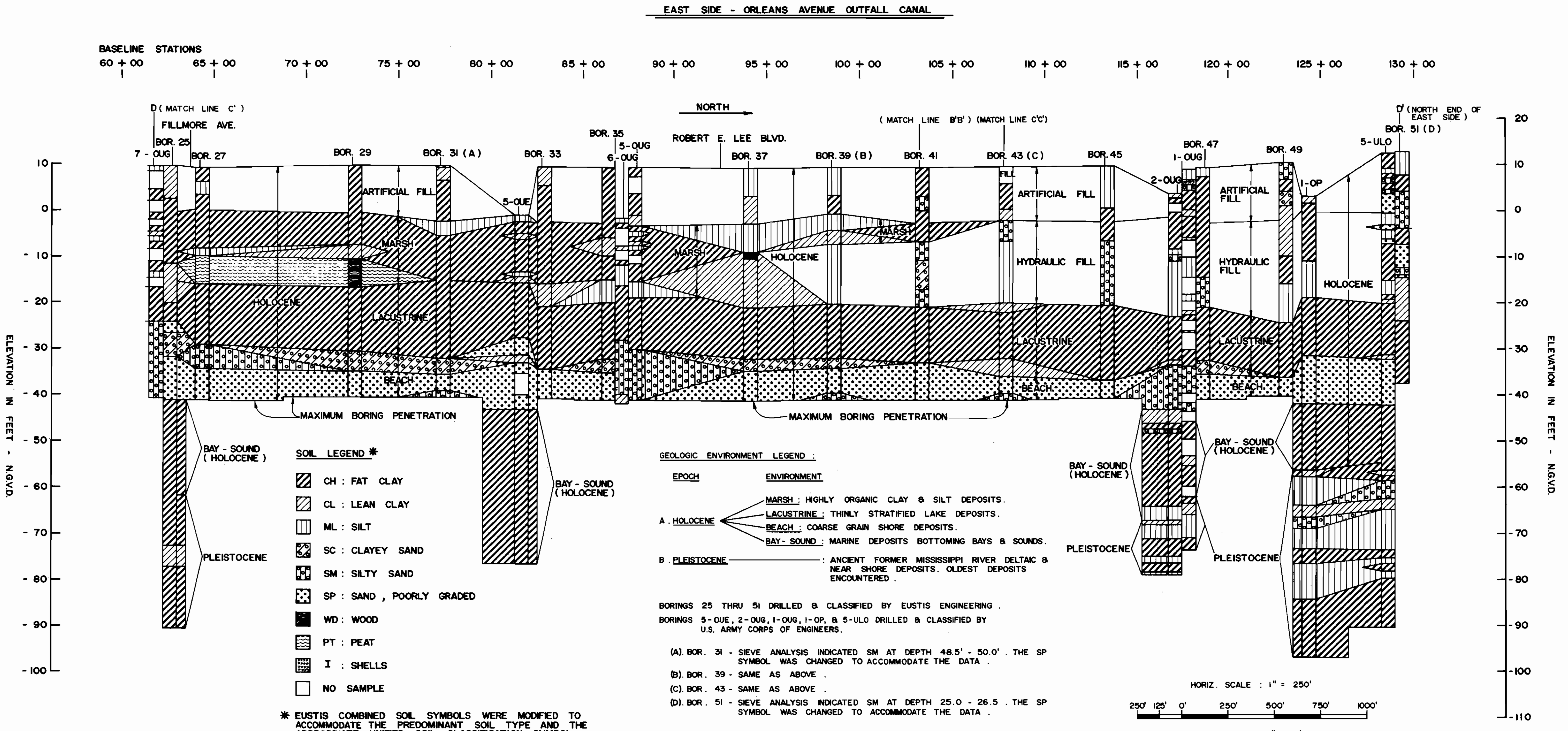
250' 125' 0' 250' 500' 750' 1000'

VERTICAL SCALE: 1"= 10'

LAKE PONTCHARTRAIN, LA. AND VICINITY
HIGH LEVEL PLAN
DESIGN MEMORANDUM NO. 19 GENERAL DESIGN
ORLEANS AVENUE OUTFALL CANAL

SOIL AND GEOLOGIC PROFILE

U.S. ARMY ENGINEER DISTRICT, NEW ORLEANS
CORPS OF ENGINEERS
JUNE 1988 FILE NO. H-2-30290



SOIL LEGEND *

- CH : FAT CLAY
- CL : LEAN CLAY
- ML : SILT
- SC : CLAYEY SAND
- SM : SILTY SAND
- SP : SAND , POORLY GRADED
- WD : WOOD
- PT : PEAT
- I : SHELLS
- NO SAMPLE

* EUSTIS COMBINED SOIL SYMBOLS WERE MODIFIED TO ACCOMMODATE THE PREDOMINANT SOIL TYPE AND THE APPROPRIATE UNIFIED SOIL CLASSIFICATION SYMBOL .

GEOLOGIC ENVIRONMENT LEGEND :

EPOCH	ENVIRONMENT
A . HOLOCENE	MARSH : HIGHLY ORGANIC CLAY & SILT DEPOSITS.
	LACUSTRINE : THINLY STRATIFIED LAKE DEPOSITS.
	BEACH : COARSE GRAIN SHORE DEPOSITS.
	BAY - SOUND : MARINE DEPOSITS BOTTOMING BAYS & SOUNDS.
B . PLEISTOCENE	: ANCIENT FORMER MISSISSIPPI RIVER DELTAIC & NEAR SHORE DEPOSITS. OLDEST DEPOSITS ENCOUNTERED .

BORINGS 25 THRU 51 DRILLED & CLASSIFIED BY EUSTIS ENGINEERING .

BORINGS 5-OUE, 2-OUG, 1-OUG, 1-OP, & 5-ULO DRILLED & CLASSIFIED BY U.S. ARMY CORPS OF ENGINEERS.

(A). BOR. 31 - SIEVE ANALYSIS INDICATED SM AT DEPTH 48.5' - 50.0' . THE SP SYMBOL WAS CHANGED TO ACCOMMODATE THE DATA .
(B). BOR. 39 - SAME AS ABOVE .
(C). BOR. 43 - SAME AS ABOVE .
(D). BOR. 51 - SIEVE ANALYSIS INDICATED SM AT DEPTH 25.0 - 26.5 . THE SP SYMBOL WAS CHANGED TO ACCOMMODATE THE DATA .

BORINGS 7-OUG, 6-OUG, & 5-OUG DRILLED BY EUSTIS ENGINEERING & CLASSIFIED BY U.S. ARMY CORPS OF ENGINEERS.

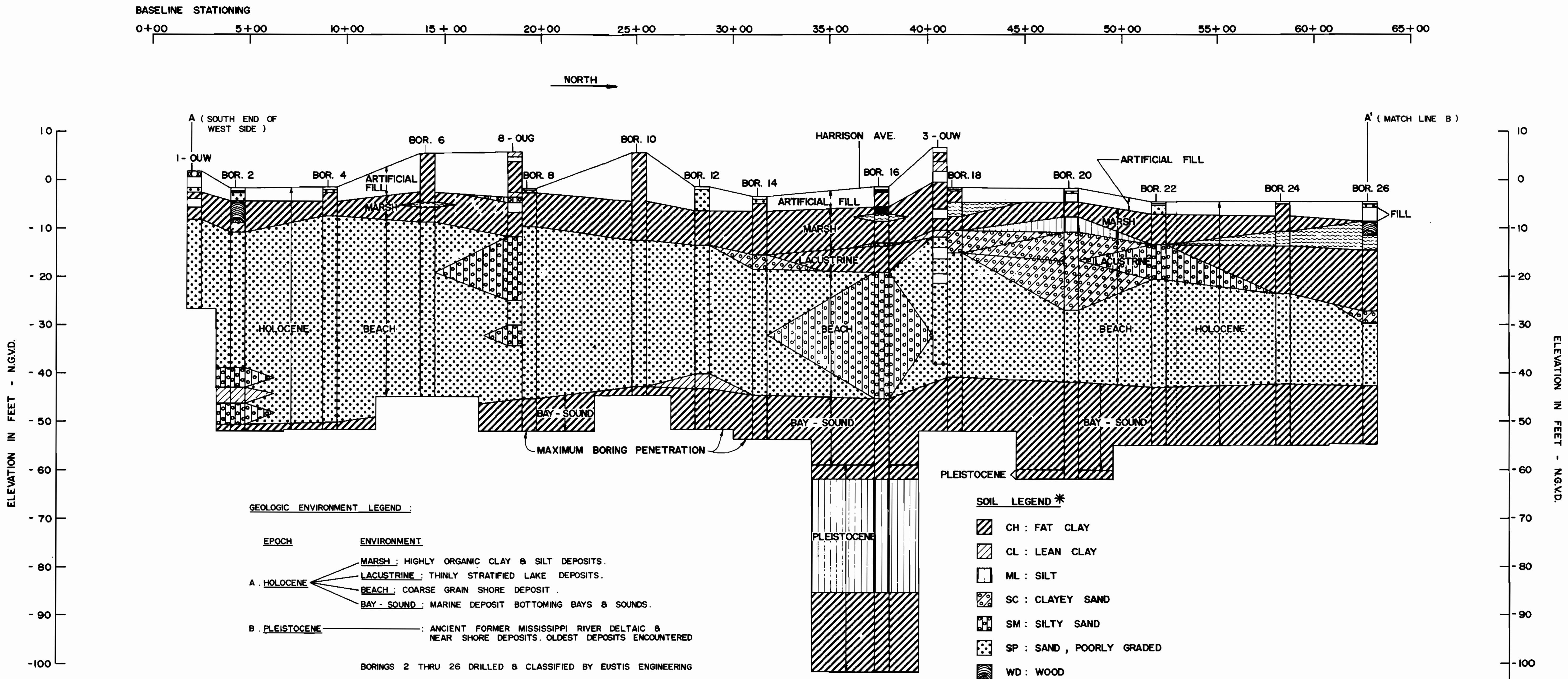
SEE FIG. 1 APPENDIX A FOR LOCATION OF EUSTIS ENGINEERING BORINGS.

LAKE PONTCHARTRAIN, LA. AND VICINITY
HIGH LEVEL PLAN
DESIGN MEMORANDUM NO. 19 GENERAL DESIGN
ORLEANS AVENUE OUTFALL CANAL

SOIL AND GEOLOGIC PROFILE

U.S. ARMY ENGINEER DISTRICT, NEW ORLEANS
CORPS OF ENGINEERS
JUNE 1988 FILE NO. H-2-30290

WEST SIDE - ORLEANS AVENUE OUTFALL CANAL



GEOLOGIC ENVIRONMENT LEGEND :

EPOCH	ENVIRONMENT
A . HOLOCENE	MARSH : HIGHLY ORGANIC CLAY & SILT DEPOSITS.
	LACUSTRINE : THINLY STRATIFIED LAKE DEPOSITS.
	BEACH : COARSE GRAIN SHORE DEPOSIT .
	BAY - SOUND : MARINE DEPOSIT BOTTOMING BAYS & SOUNDS.
B . PLEISTOCENE	ANCIENT FORMER MISSISSIPPI RIVER DELTAIC & NEAR SHORE DEPOSITS. OLDEST DEPOSITS ENCOUNTERED

BORINGS 2 THRU 26 DRILLED & CLASSIFIED BY EUSTIS ENGINEERING

BORINGS 1 - OUW & 3 - OUW DRILLED & CLASSIFIED BY U.S. ARMY CORPS OF ENGINEERS.

BORING 8 - OUG DRILLED BY EUSTIS ENGINEERING & CLASSIFIED BY U.S. ARMY CORPS OF ENGINEERS.

SEE FIG. 1 APPENDIX A FOR LOCATION OF EUSTIS ENGINEERING BORINGS.

HORIZ. SCALE : 1" = 250'

250' 125' 0' 250' 500' 750' 1000'

VERT. SCALE : 1" = 10'

SOIL LEGEND *

- CH : FAT CLAY
- CL : LEAN CLAY
- ML : SILT
- SC : CLAYEY SAND
- SM : SILTY SAND
- SP : SAND , POORLY GRADED
- WD : WOOD
- PT : PEAT
- I : SHELLS
- NO SAMPLE

* EUSTIS ENGINEERING SOIL SYMBOLS WERE MODIFIED TO ACCOMMODATE THE PREDOMINANT SOIL TYPE AND THE APPROPRIATE UNIFIED SOIL CLASSIFICATION SYMBOL

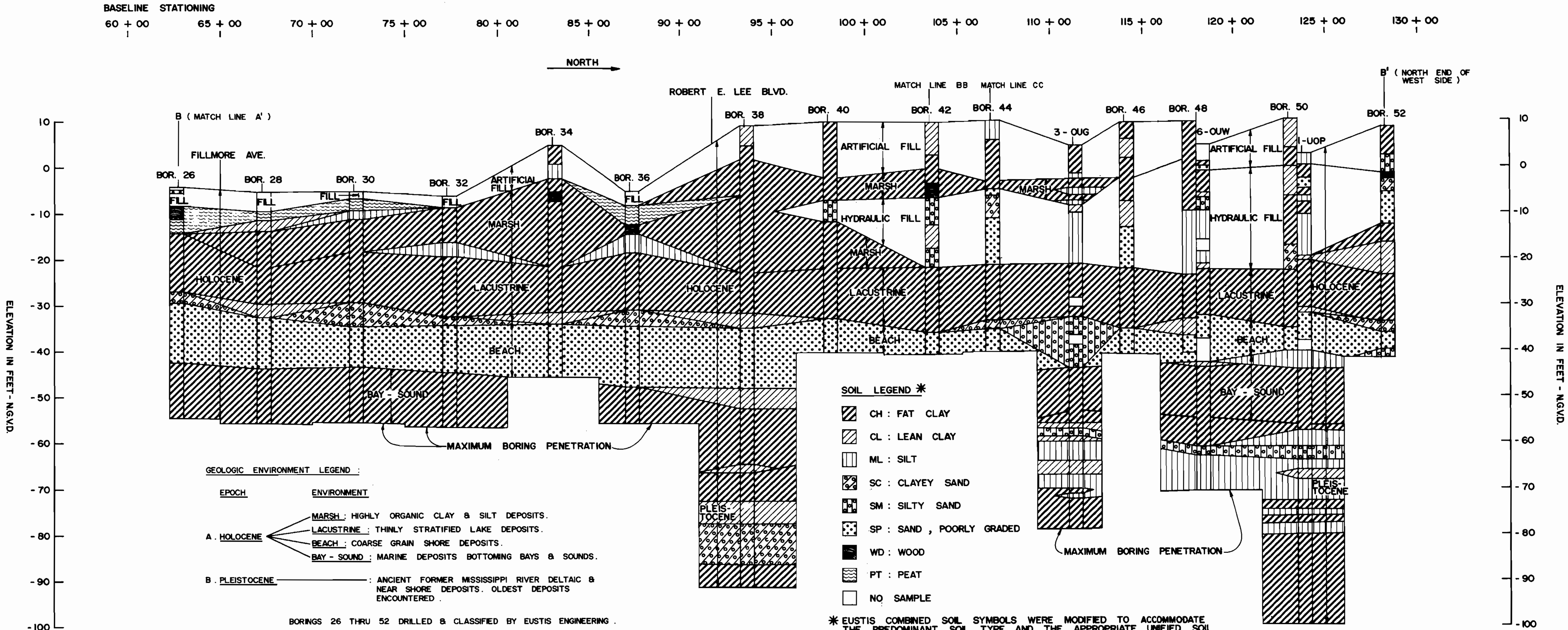
LAKE PONTCHARTRAIN , LA. AND VICINITY
HIGH LEVEL PLAN
DESIGN MEMORANDUM NO. 19 GENERAL DESIGN
ORLEANS AVENUE OUTFALL CANAL

SOIL AND GEOLOGIC PROFILE

U.S. ARMY ENGINEER DISTRICT, NEW ORLEANS
CORPS OF ENGINEERS

JUNE 1988 FILE NO. H-2-30290

WEST SIDE - ORLEANS AVENUE OUTFALL CANAL



GEOLOGIC ENVIRONMENT LEGEND :

EPOCH	ENVIRONMENT
A . HOLOCENE	MARSH : HIGHLY ORGANIC CLAY & SILT DEPOSITS.
	LACUSTRINE : THINLY STRATIFIED LAKE DEPOSITS.
	BEACH : COARSE GRAIN SHORE DEPOSITS.
	BAY - SOUND : MARINE DEPOSITS BOTTOMING BAYS & SOUNDS.
B . PLEISTOCENE	ANCIENT FORMER MISSISSIPPI RIVER DELTAIC & NEAR SHORE DEPOSITS. OLDEST DEPOSITS ENCOUNTERED .

BORINGS 26 THRU 52 DRILLED & CLASSIFIED BY EUSTIS ENGINEERING .

BORINGS 3 - OUG , 6 - OUW , AND I - UOP DRILLED & CLASSIFIED BY U.S. ARMY CORPS OF ENGINEERS .

SEE FIG. I APPENDIX A FOR LOCATION OF EUSTIS ENGINEERING BORINGS.

SOIL LEGEND *

- CH : FAT CLAY
- CL : LEAN CLAY
- ML : SILT
- SC : CLAYEY SAND
- SM : SILTY SAND
- SP : SAND , POORLY GRADED
- WD : WOOD
- PT : PEAT
- NO SAMPLE

* EUSTIS COMBINED SOIL SYMBOLS WERE MODIFIED TO ACCOMMODATE THE PREDOMINANT SOIL TYPE AND THE APPROPRIATE UNIFIED SOIL CLASSIFICATION SYMBOL .

HORIZ. SCALE : 1" = 250'

250' 125' 0' 250' 500' 750' 1000'

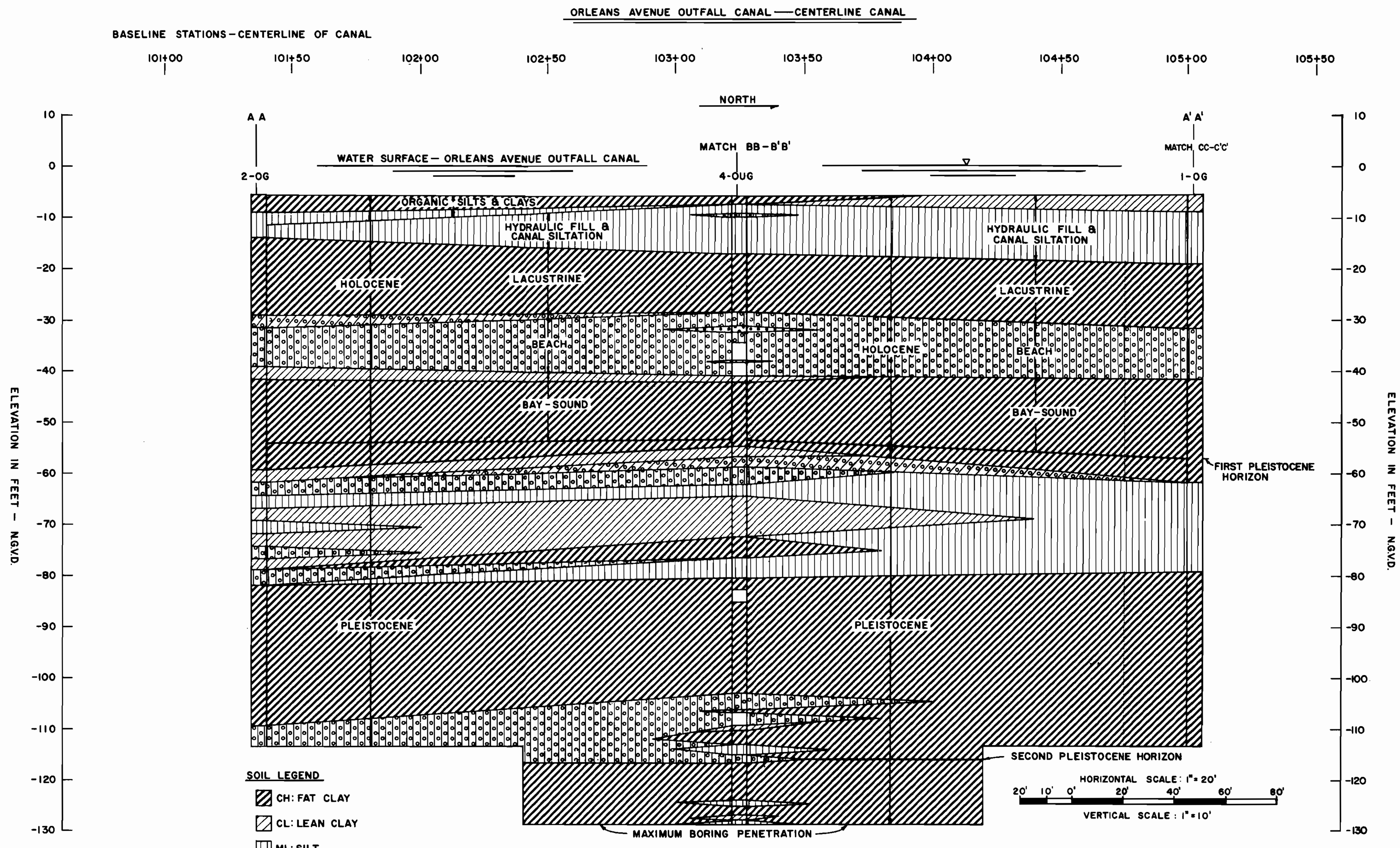
VERT. SCALE : 1" = 10'

LAKE PONTCHARTRAIN , LA. AND VICINITY
HIGH LEVEL PLAN
DESIGN MEMORANDUM NO. 19 GENERAL DESIGN
ORLEANS AVENUE OUTFALL CANAL

SOIL AND GEOLOGIC PROFILE

U.S. ARMY ENGINEER DISTRICT, NEW ORLEANS
CORPS OF ENGINEERS

JUNE 1988 FILE NO. H-2-30290



SOIL LEGEND

- CH: FAT CLAY
- CL: LEAN CLAY
- ML: SILT
- SC: CLAYEY SAND
- SM: SILTY SAND
- SP: SAND, POORLY GRADED
- NO SAMPLE

2-OG, 4-OUG, AND 1-OG DRILLED, SAMPLED AND CLASSIFIED BY U.S. ARMY CORPS. OF ENGINEERS.

GEOLOGIC ENVIRONMENT LEGEND

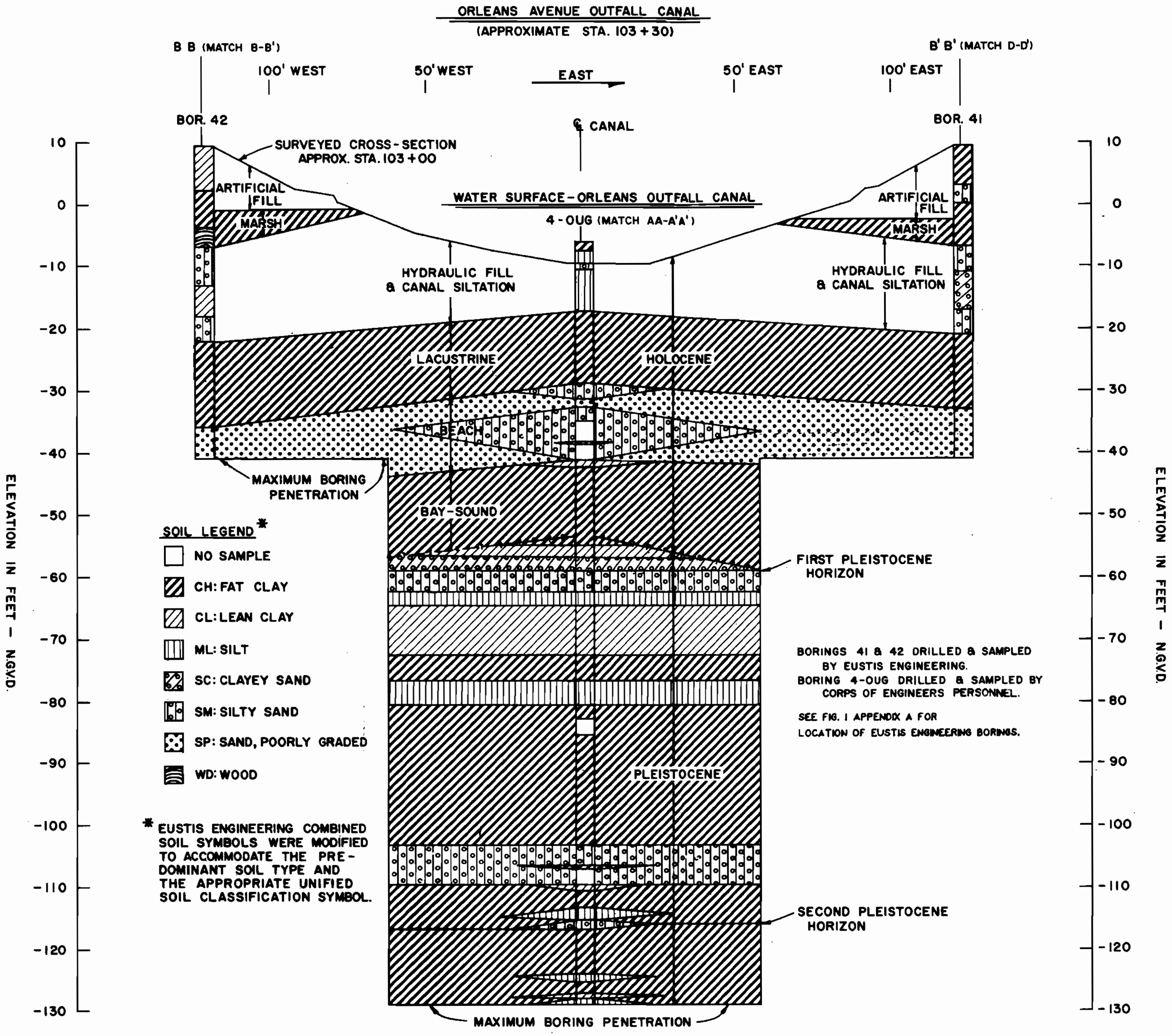
EPOCH	ENVIRONMENT
A. HOLOCENE	LACUSTRINE: THINLY STRATIFIED FINE GRAIN LAKE DEPOSITS BEACH: COARSE GRAIN SHORE DEPOSITS BAY-SOUND: MARINE DEPOSITS BOTTOMING BAYS & SOUNDS
B. PLEISTOCENE	: ANCIENT FORMER MISS. RIVER DELTAIC & NEAR SHORE DEPOSITS OLDEST DEPOSITS ENCOUNTERED a. FIRST HORIZON: MAYBE EQUIVALENT TO DEWEYVILLE OR PRAIRIE TERRACE DEPOSITS b. SECOND HORIZON: ERODED & OXIDIZED SURFACE UNDERLYING FIRST HORIZON BY 50–100 FT. AGE IS CONJECTURAL AT THIS TIME.

LAKE PONTCHARTRAIN, LA. AND VICINITY
HIGH LEVEL PLAN
DESIGN MEMORANDUM NO. 19 GENERAL DESIGN
ORLEANS AVENUE OUTFALL CANAL

SOIL AND GEOLOGIC PROFILE

U.S. ARMY ENGINEER DISTRICT, NEW ORLEANS
CORPS OF ENGINEERS

JUNE 1988 FILE NO. H-2-30290



GEOLOGIC ENVIRONMENT LEGEND

EPOCH	ENVIRONMENT
A. HOLOCENE	LACUSTRINE: THINLY STRATIFIED FINE GRAIN LAKE DEPOSITS
	BEACH: COARSE GRAIN SHORE DEPOSITS
	BAY-SOUND: MARINE DEPOSITS BOTTOMING BAYS & SOUNDS
	MARSH: FINE GRAIN ORGANIC DEPOSITS
B. PLEISTOCENE	: ANCIENT FORMER MISS. RIVER DELTAIC & NEAR SHORE DEPOSITS OLDEST DEPOSITS ENCOUNTERED
	a. FIRST HORIZON: MAYBE EQUIVALENT TO DEWEYVILLE OR PRAIRIE TERRACE DEPOSITS
	b. SECOND HORIZON: ERODED & OXIDIZED SURFACE UNDERLYING FIRST HORIZON BY 50-100 FT. AGE IS CONJECTURAL AT THIS TIME.

HORIZONTAL SCALE: 1" = 20'

20' 10' 0' 20' 40' 50' 60' 80' 100'

VERTICAL SCALE: 1" = 10'

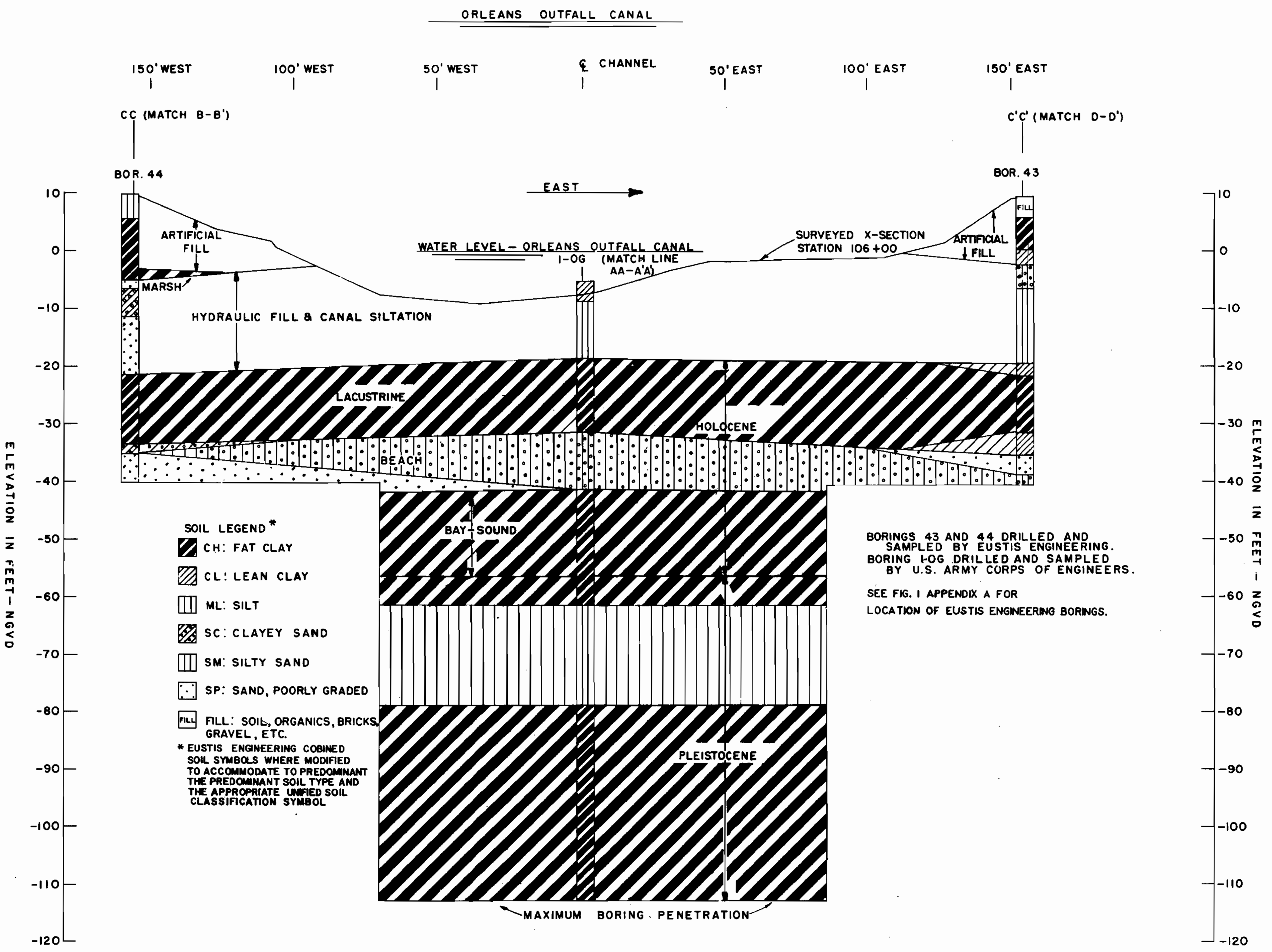
LAKE PONTCHARTRAIN, LA. AND VICINITY
HIGH LEVEL PLAN
DESIGN MEMORANDUM NO. 19 GENERAL DESIGN
ORLEANS AVENUE OUTFALL CANAL

SOIL AND GEOLOGIC PROFILE

U.S. ARMY ENGINEER DISTRICT, NEW ORLEANS
CORPS OF ENGINEERS

JUNE 1988 FILE NO. H-2-30290

PLATE 18



GEOLOGIC ENVIRONMENT LEGEND

EPOCH	ENVIRONMENT
A. HOLOCENE	LACUSTRINE: THINLY STRATIFIED FINE GRAIN LAKE DEPOSITS
	BEACH: COARSE GRAIN SHORE DEPOSIT.
	BAY– SOUND: MARINE DEPOSITS BOTTOMING BAYS & SOUNDS
	MARSH: FINE GRAIN ORGANIC DEPOSITS.
B. PLEISTOCENE	ANCIENT FORMER MISS. RIVER DELTAIC & NEARSHORE DEPOSITS. OLDEST DEPOSITS ENCOUNTERED.

HORIZONTAL SCALE: 1" = 200'

200' 100' 0' 200' 400' 600' 800' 1000'

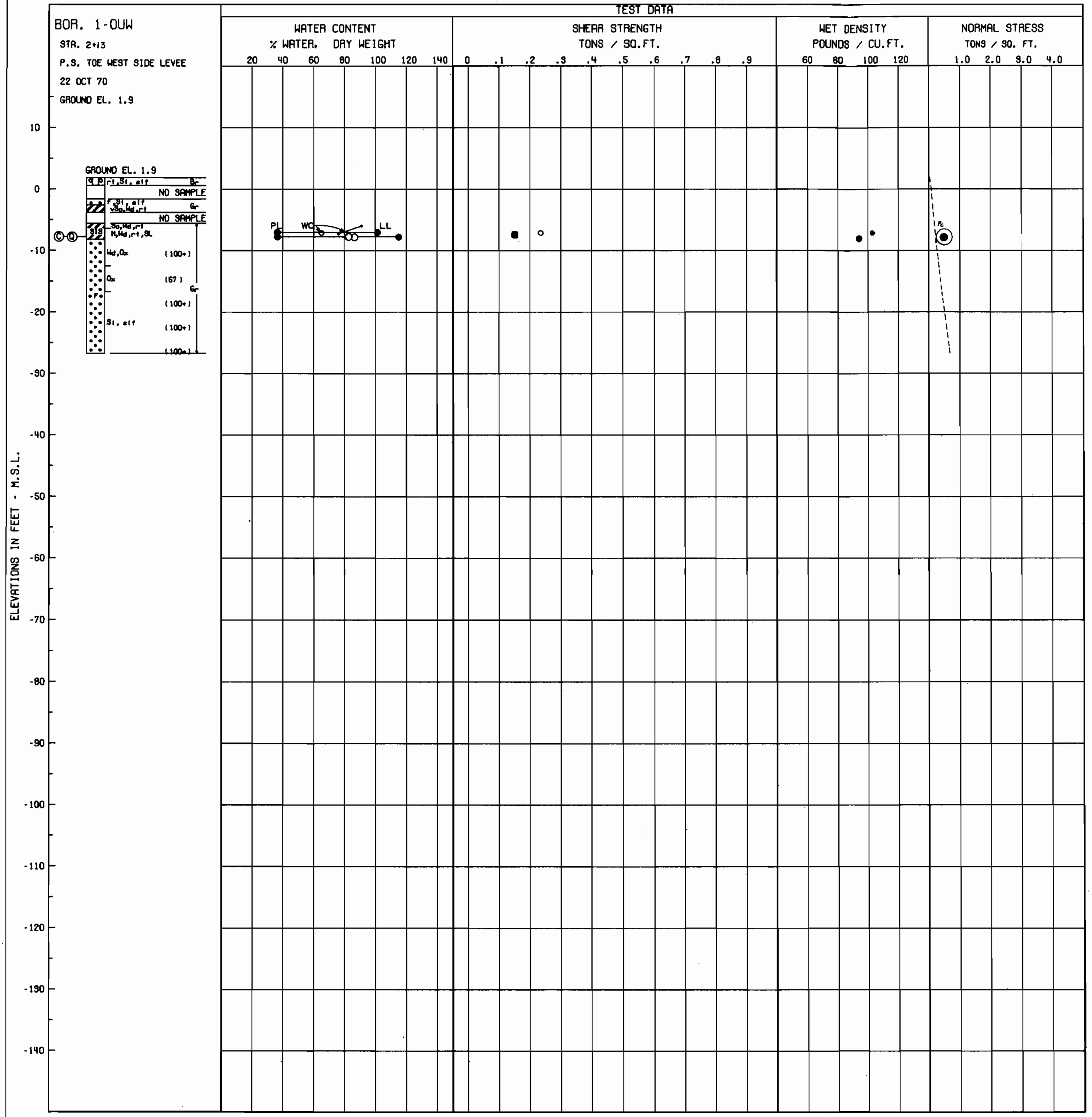
VERTICAL SCALE: 1" = 10'

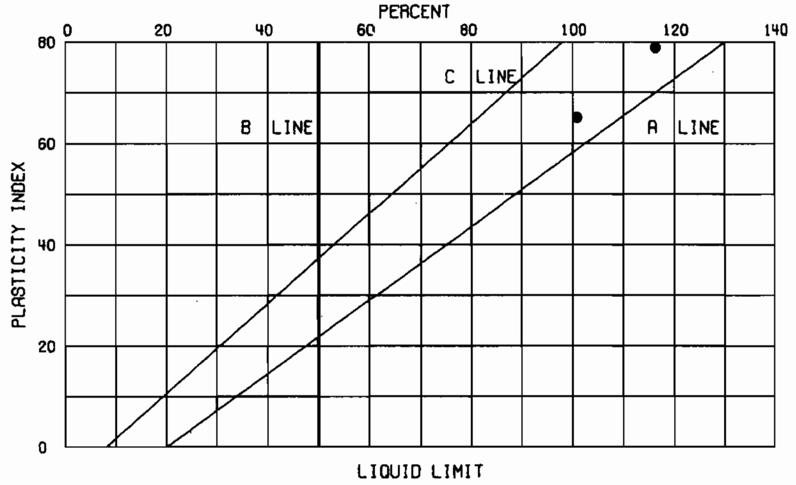
LAKE PONTCHARTRAIN, LA. AND VICINITY
HIGH LEVEL PLAN
DESIGN MEMORANDUM NO. 19 GENERAL DESIGN
ORLEANS AVENUE OUTFALL CANAL

SOIL AND GEOLOGIC PROFILE

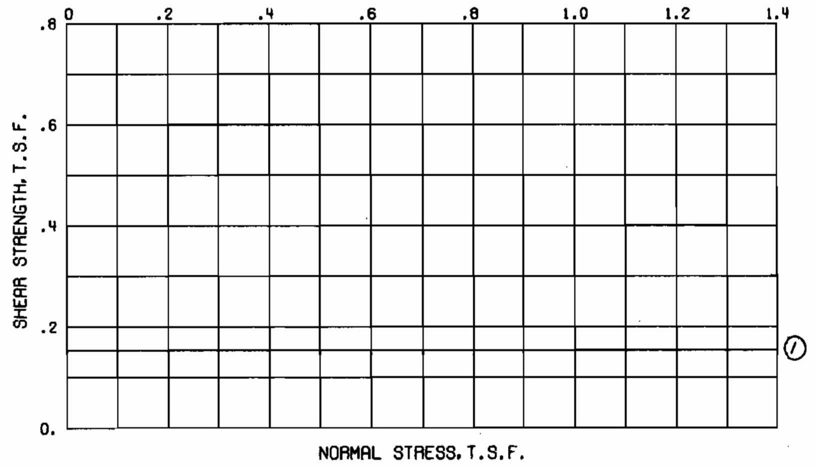
U.S. ARMY ENGINEER DISTRICT, NEW ORLEANS
CORPS OF ENGINEERS

JUNE 1988 FILE NO. H-2-30290



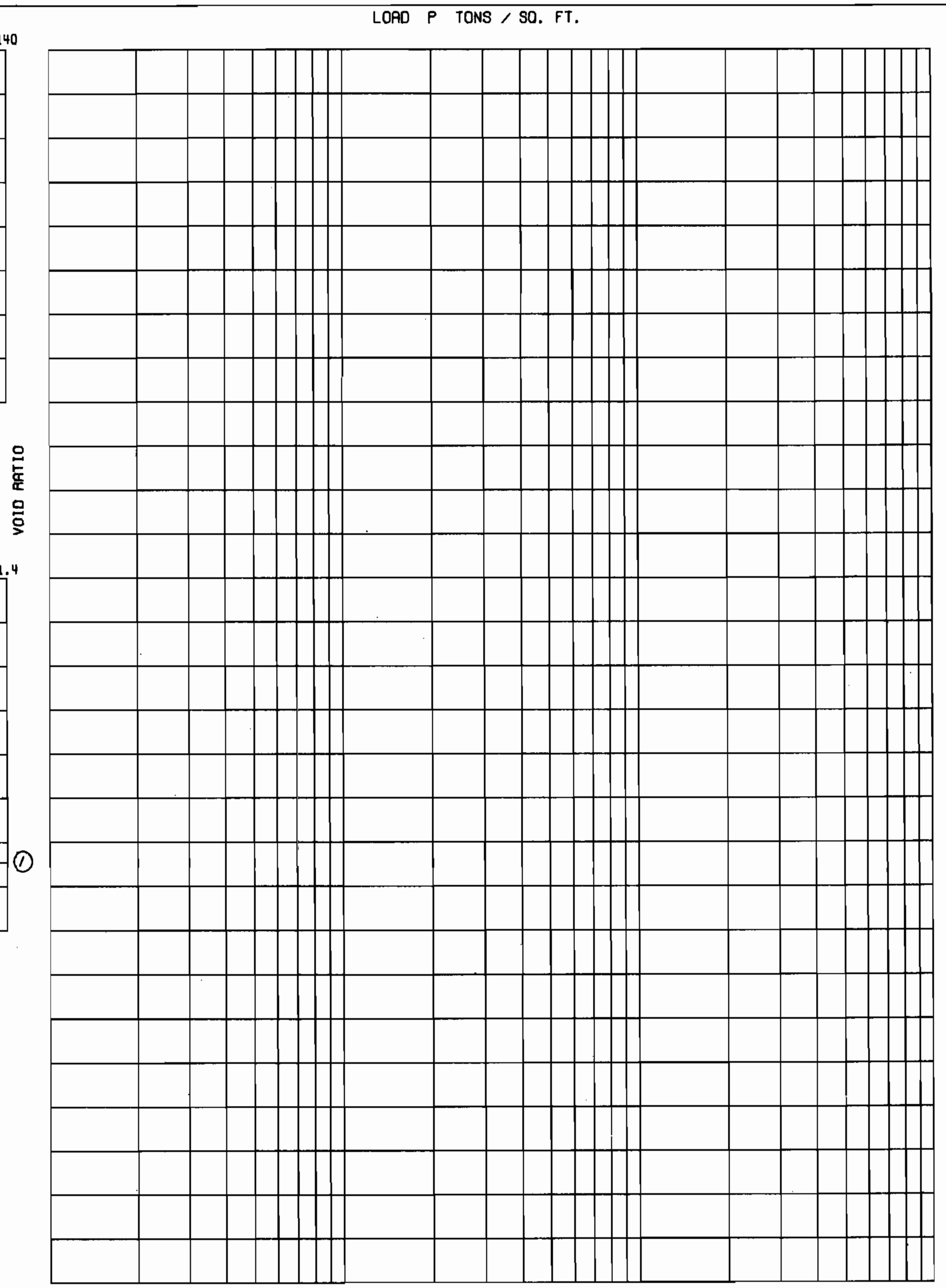


PLASTICITY CHART



SHEAR STRENGTH DATA

BORING NO.	ENVELOPE NO.	ENVELOPE EL.	TYPE	STRENGTH Φ°	STRENGTH C - TSF	CLASS
	1	-7.7	Q	0	0.16	CH



CONSOLIDATION DATA

○ - (UC) UNCONFINED COMPRESSION TEST
■ - (Q) UNCONSOLIDATED - UNDRAINED SHEAR TEST
▲ - (R) CONSOLIDATED - UNDRAINED SHEAR TEST
□ - (S) CONSOLIDATED - DRAINED SHEAR TEST

BORINGS WERE TAKEN WITH A 5 INCH DIAMETER STEEL TUBE PISTON TYPE SAMPLER

FOR SOIL BORING LEGEND SEE PLATE A

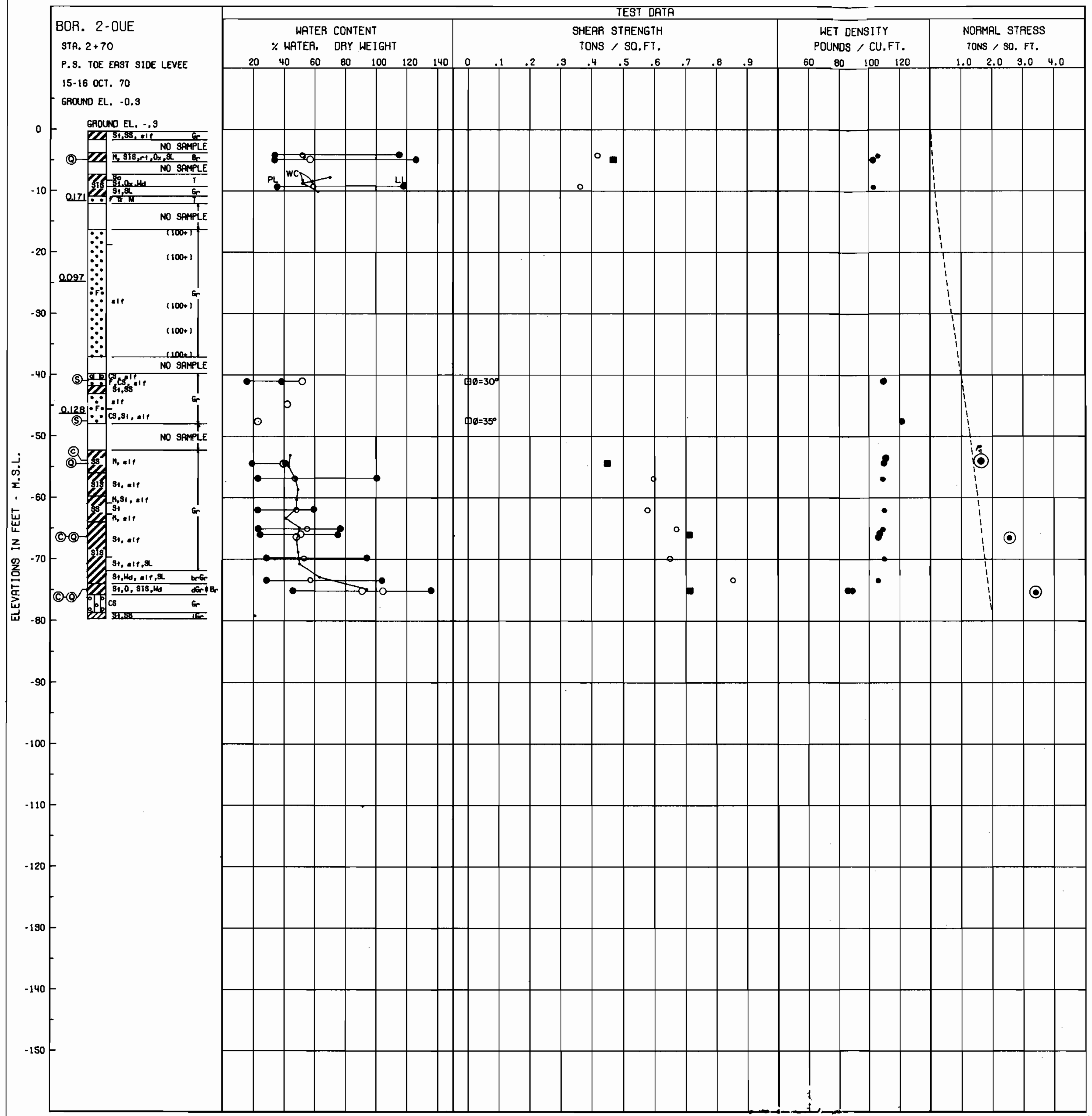
FOR LOCATION OF BORINGS SEE PLATE 12A

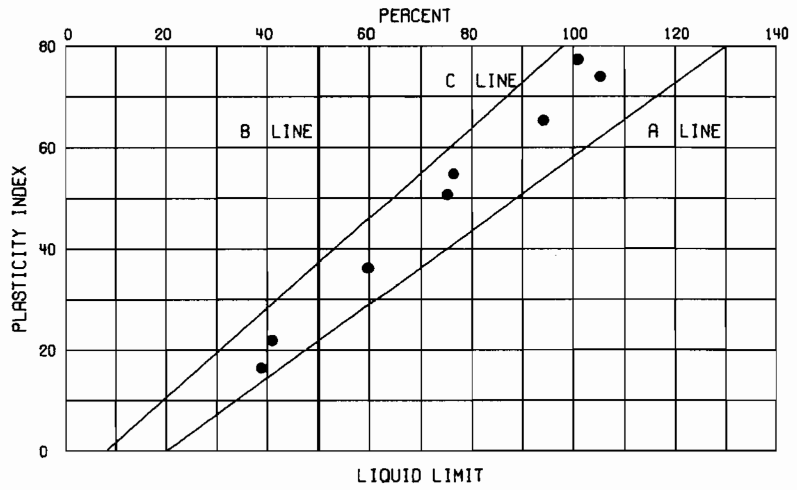
LAKE PONTCHARTRAIN, LA. AND VICINITY
HIGH LEVEL PLAN
DESIGN MEMORANDUM NO. 19 GENERAL DESIGN
ORLEANS AVENUE OUTFALL CANAL

UNDISTURBED BORING NO. 1-OUW

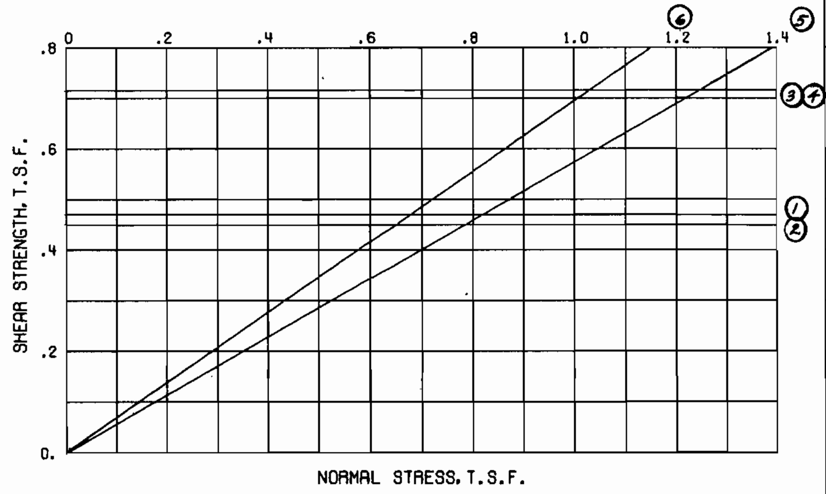
U.S. ARMY ENGINEER DISTRICT, NEW ORLEANS
CORPS OF ENGINEERS

JUNE 1988 FILE NO. H-2-30290



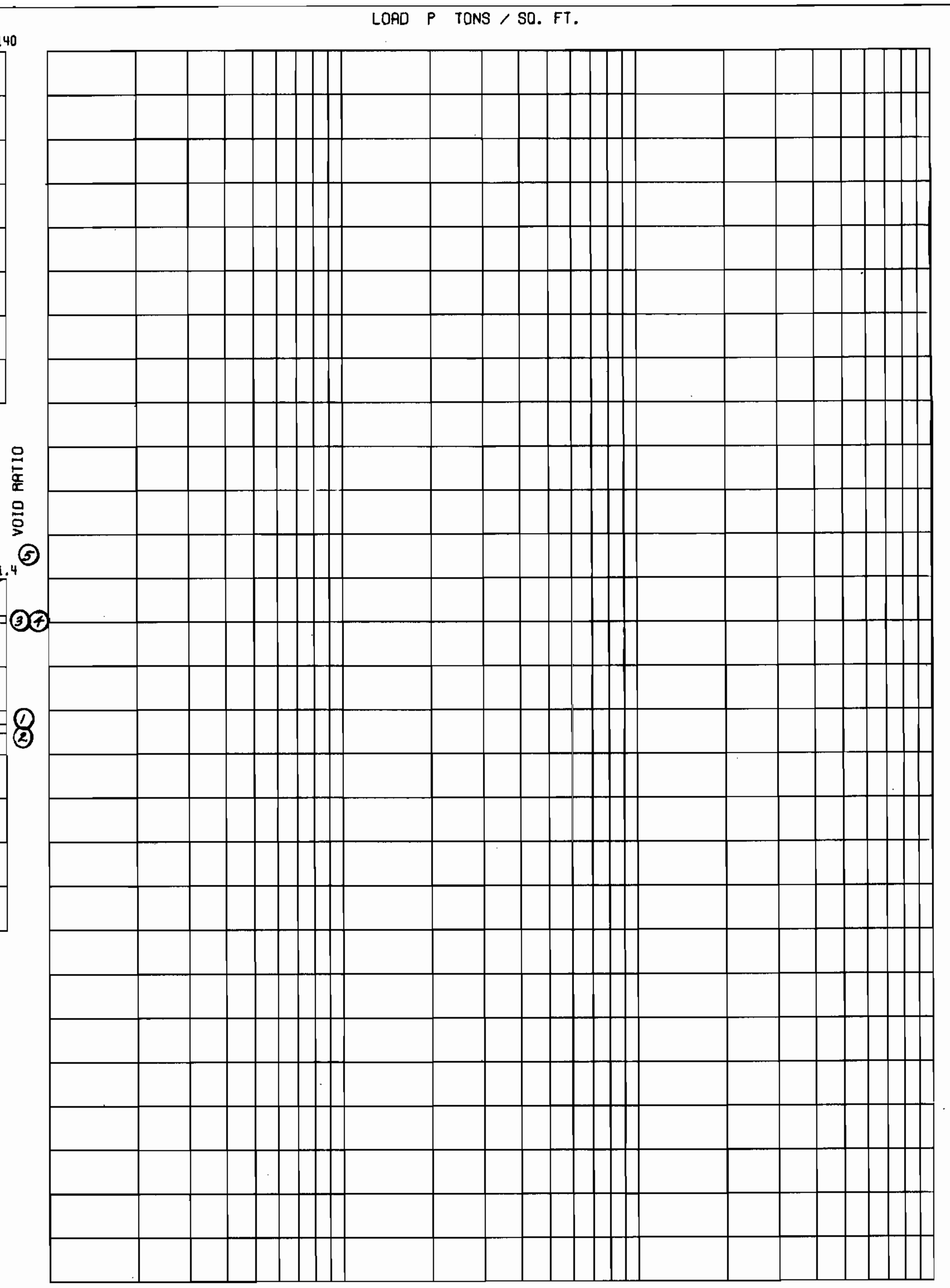


PLASTICITY CHART



SHEAR STRENGTH DATA

BORING NO.	ENVELOPE NO.	ENVELOPE EL.	TYPE	STRENGTH Φ°	STRENGTH C - TSF	CLASS
	1	-4.9	Q	0	0.47	CH
	2	-54.4		0	0.45	CL
	3	-66.3		0	0.72	CH
	4	-75.1		0	0.72	CH
	5	-40.9	S	30	0	CL
	6	-47.5		35	0	SP



CONSOLIDATION DATA

○ - (UC) UNCONFINED COMPRESSION TEST
■ - (Q) UNCONSOLIDATED - UNDRAINED SHEAR TEST
▲ - (R) CONSOLIDATED - UNDRAINED SHEAR TEST
□ - (S) CONSOLIDATED - DRAINED SHEAR TEST

BORINGS WERE TAKEN WITH A 5 INCH DIAMETER STEEL TUBE PISTON TYPE SAMPLER

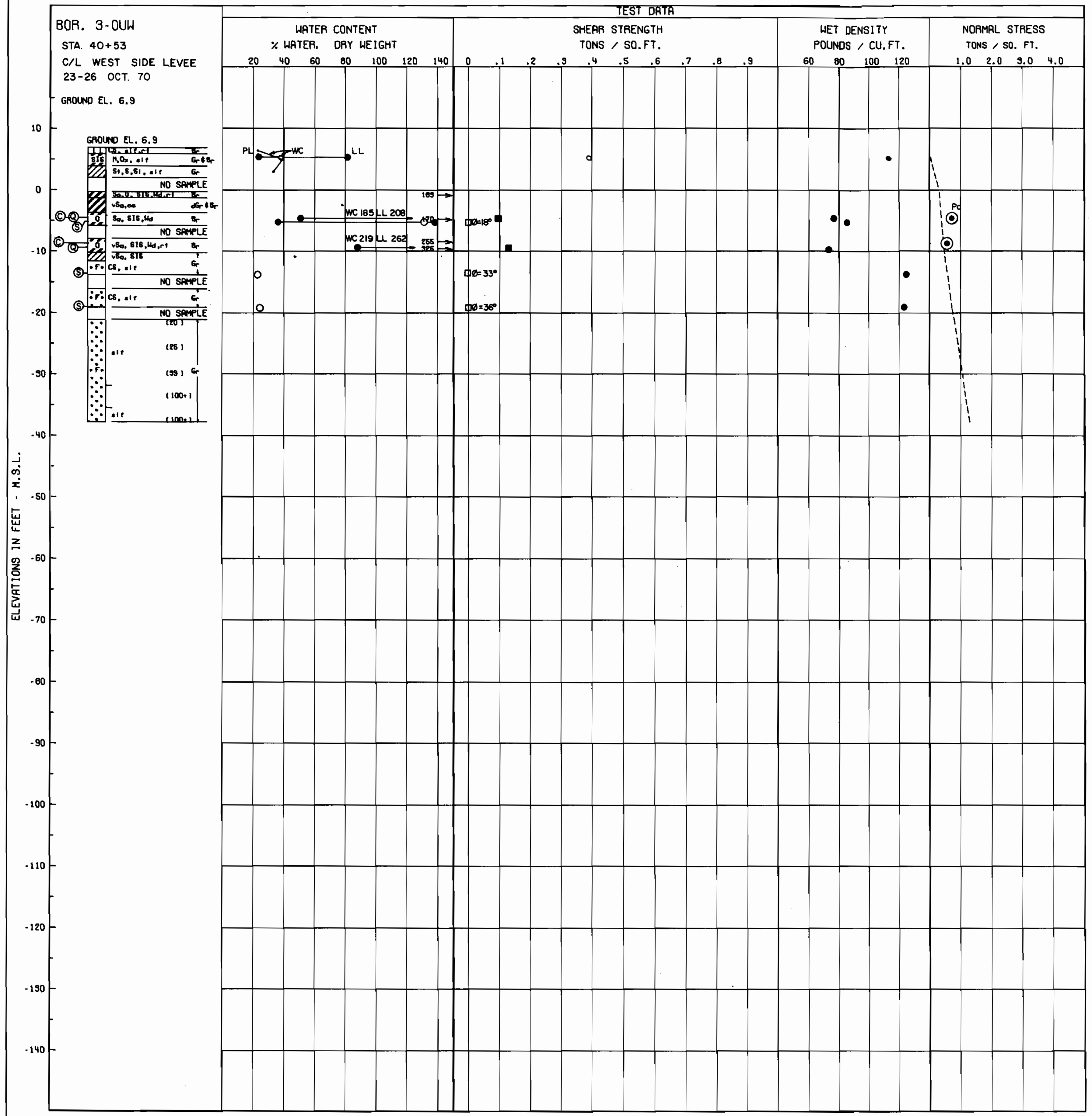
FOR SOIL BORING LEGEND SEE PLATE A

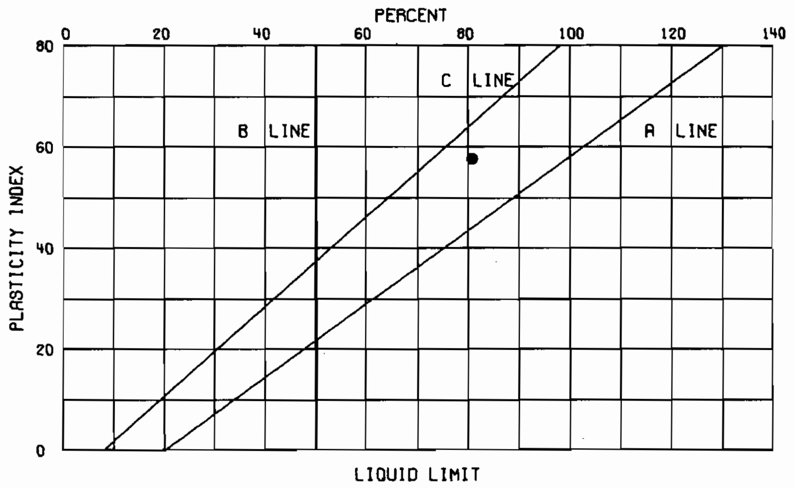
FOR LOCATION OF BORINGS SEE PLATE 12A

LAKE PONTCHARTRAIN, LA. AND VICINITY
HIGH LEVEL PLAN
DESIGN MEMORANDUM NO. 19 GENERAL DESIGN
ORLEANS AVENUE OUTFALL CANAL

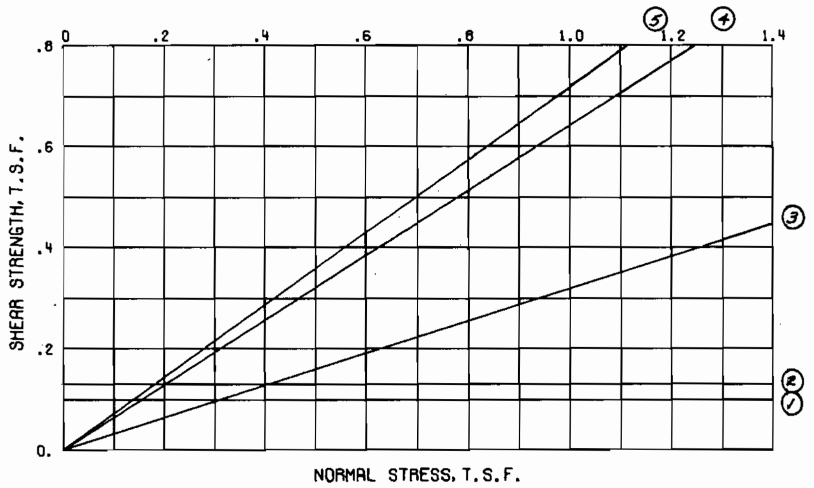
UNDISTURBED BORING NO. 2-OUE

U.S. ARMY ENGINEER DISTRICT, NEW ORLEANS
CORPS OF ENGINEERS
JUNE 1988 FILE NO. H-2-30290



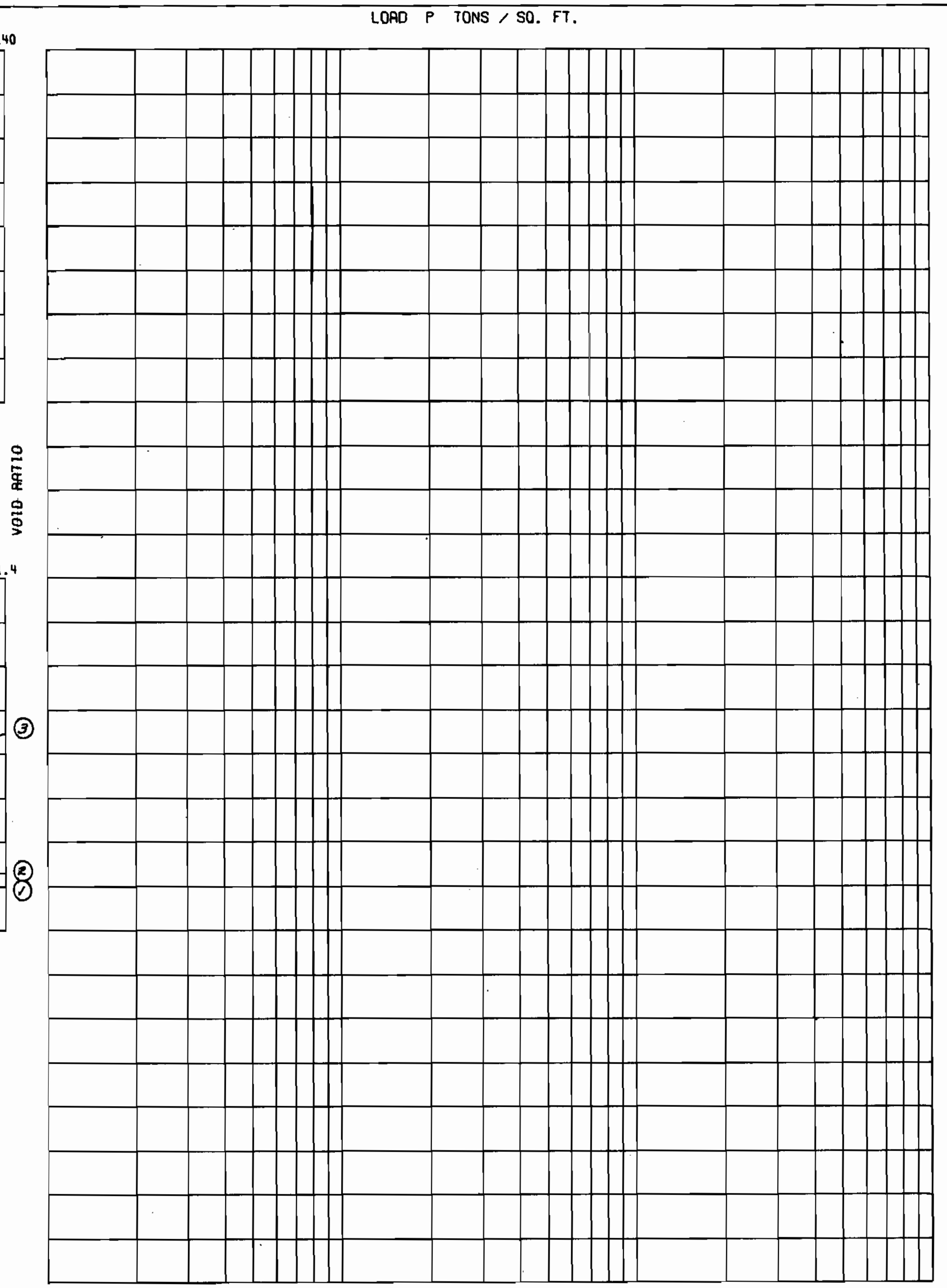


PLASTICITY CHART



SHEAR STRENGTH DATA

BORING NO.	ENVELOPE NO.	ENVELOPE EL.	TYPE	STRENGTH Φ°	STRENGTH C - TSF	CLASS
	1	-4.5	Q	0	0.100	CH
	2	-9.5		0	0.130	OH
	3	-5.2	S	18	0	CH
	4	-13.5		33	0	SM
	5	-18.8		36	0	SM



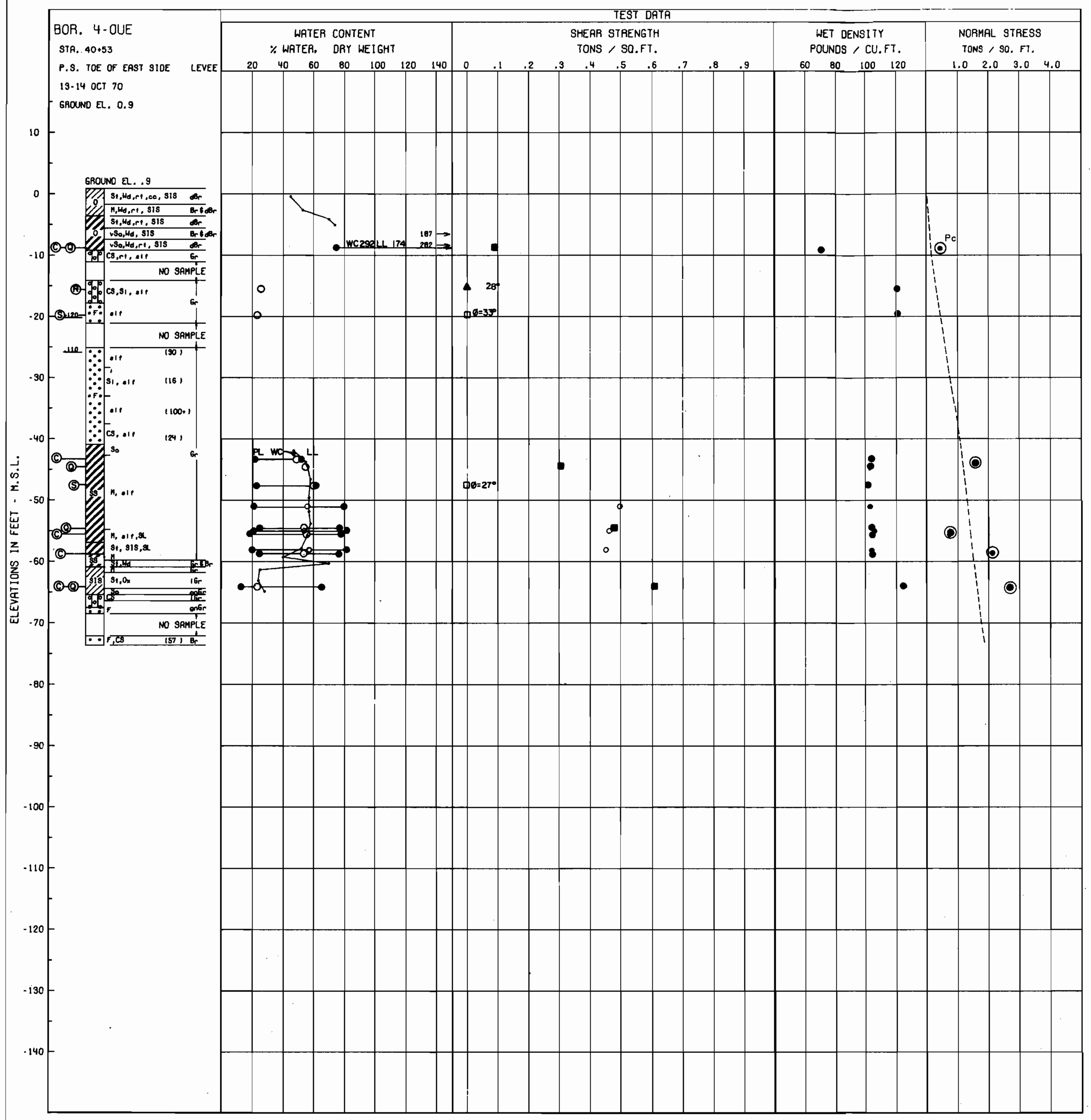
CONSOLIDATION DATA

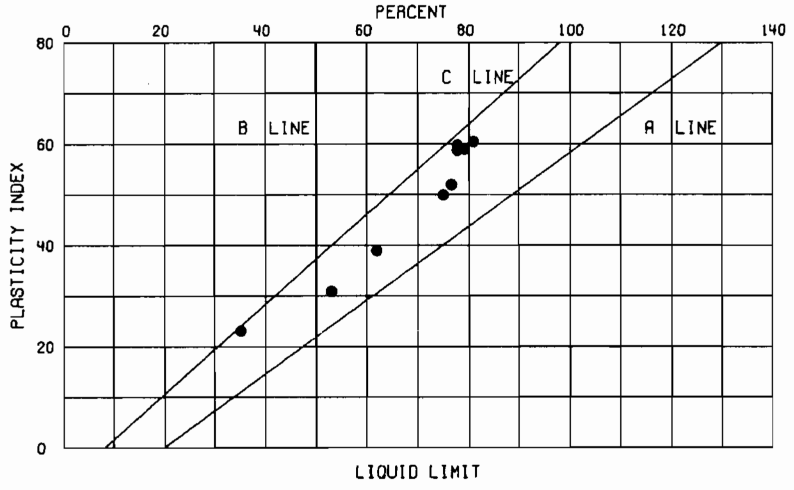
○ - (UC) UNCONFINED COMPRESSION TEST
■ - (Q) UNCONSOLIDATED - UNDRAINED SHEAR TEST
▲ - (R) CONSOLIDATED - UNDRAINED SHEAR TEST
□ - (S) CONSOLIDATED - DRAINED SHEAR TEST
BORINGS WERE TAKEN WITH A 5 INCH DIAMETER STEEL TUBE PISTON TYPE SAMPLER
FOR SOIL BORING LEGEND SEE PLATE A
FOR LOCATION OF BORINGS SEE PLATE 12 A

LAKE PONTCHARTRAIN, LA. AND VICINITY
HIGH LEVEL PLAN
DESIGN MEMORANDUM NO. 19 GENERAL DESIGN
ORLEANS AVENUE OUTFALL CANAL

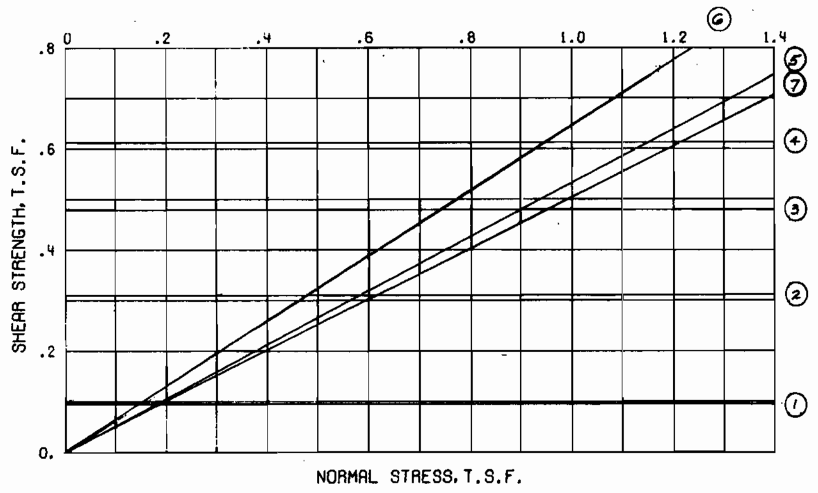
UNDISTURBED BORING NO. 3-OUW

U.S. ARMY ENGINEER DISTRICT, NEW ORLEANS
CORPS OF ENGINEERS
JUNE 1988 FILE NO H-2-30290



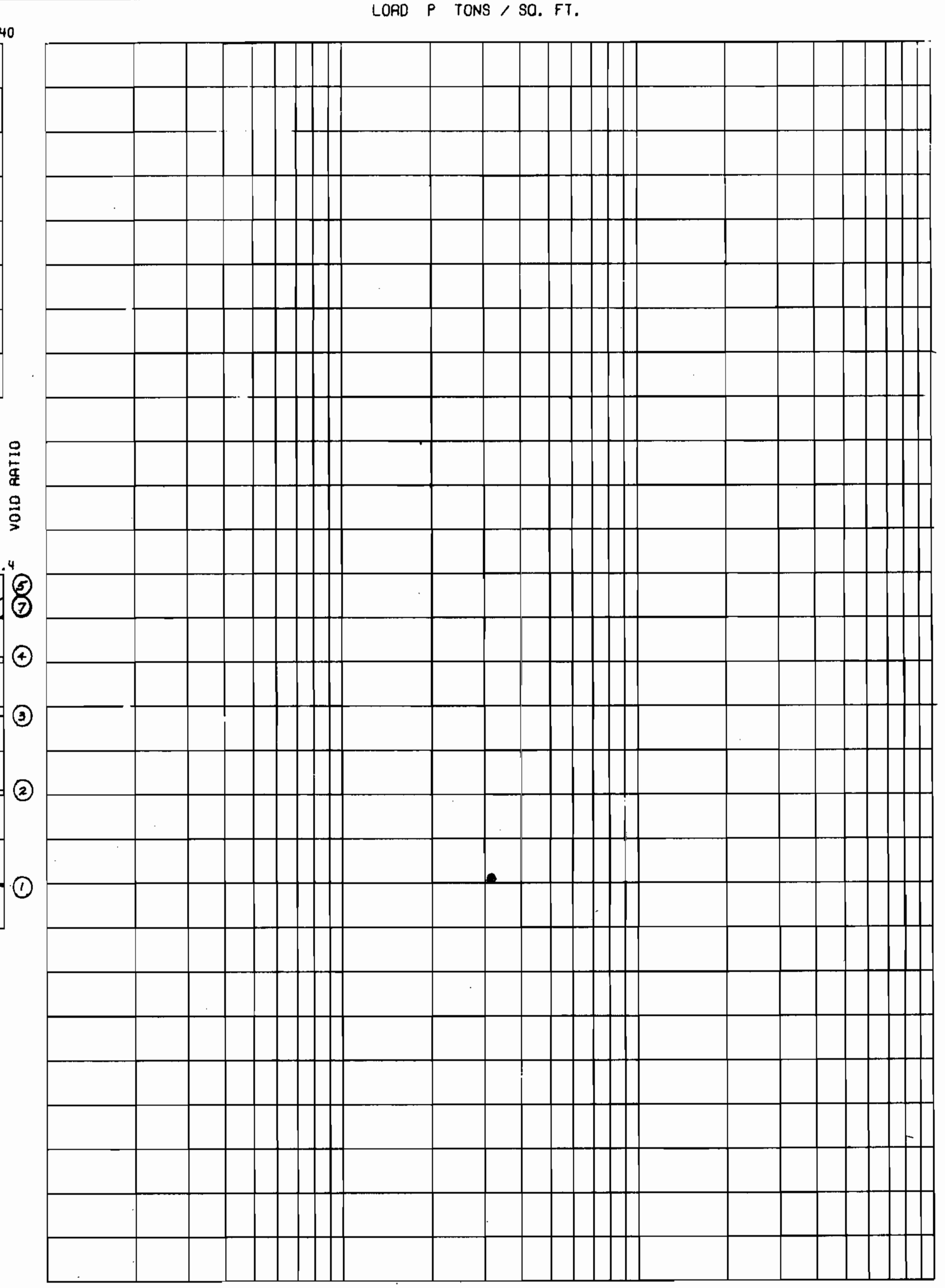


PLASTICITY CHART



SHEAR STRENGTH DATA

BORING NO.	ENVELOPE NO.	ENVELOPE EL.	TYPE	STRENGTH Φ°	STRENGTH C - TSF	CLASS
	1	-8.7	Q	0	0.08	OH
	2	-44.3		0	0.31	CH
	3	-54.3		0	0.48	CH
	4	-64.0		0	0.61	CL
	5	-16.0	R	28	0	SM
	6	-19.7	S	33	0	SM
	7	-47.5		27	0	CH



CONSOLIDATION DATA

○ - (UC) UNCONFINED COMPRESSION TEST
■ - (Q) UNCONSOLIDATED - UNDRAINED SHEAR TEST
▲ - (R) CONSOLIDATED - UNDRAINED SHEAR TEST
□ - (S) CONSOLIDATED - DRAINED SHEAR TEST

BORINGS WERE TAKEN WITH A 5 INCH DIAMETER STEEL TUBE PISTON TYPE SAMPLER

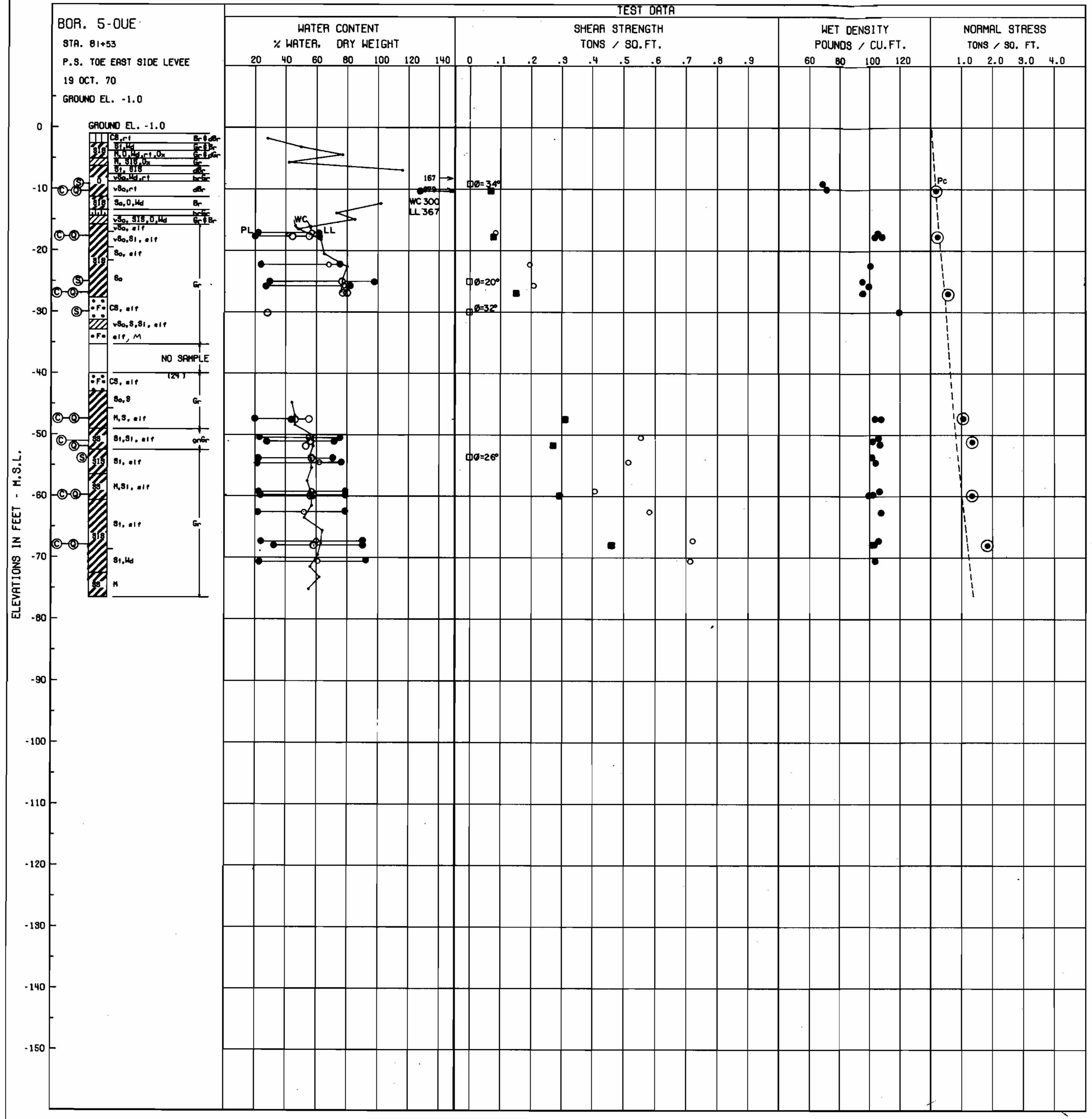
FOR SOIL BORING LEGEND SEE PLATE A
FOR LOCATION OF BORINGS SEE PLATE 12A

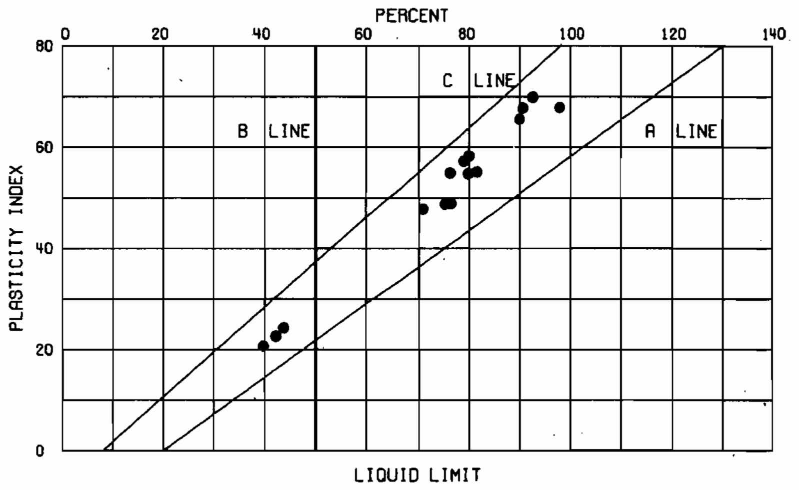
LAKE PONTCHARTRAIN, LA. AND VICINITY
HIGH LEVEL PLAN
DESIGN MEMORANDUM NO. 19 GENERAL DESIGN
ORLEANS AVENUE OUTFALL CANAL

UNDISTURBED BORING NO.4-OUE

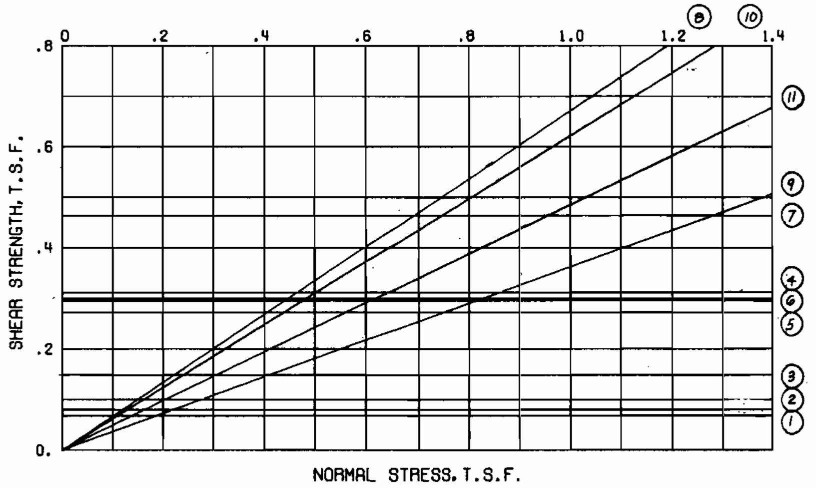
U.S. ARMY ENGINEER DISTRICT, NEW ORLEANS
CORPS OF ENGINEERS

JUNE 1988 FILE NO. H-2-30290



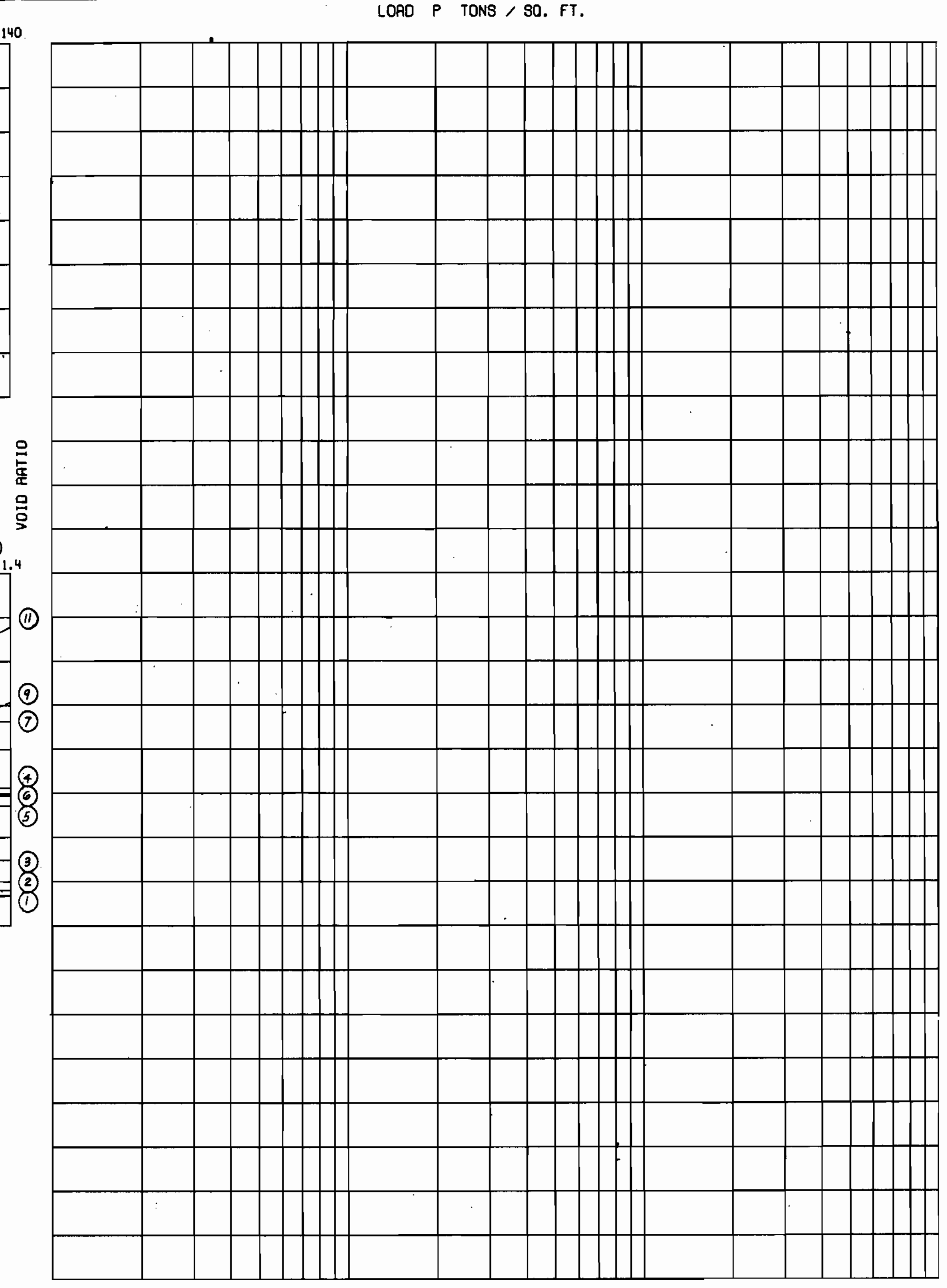


PLASTICITY CHART



SHEAR STRENGTH DATA

BORING NO.	ENVELOPE NO.	ENVELOPE EL.	TYPE	STRENGTH Φ°	STRENGTH C - TSF	CLASS
	1	-10.1	Q	0	0.07	OH
	2	-17.7		0	0.08	CL
	3	-26.8		0	0.15	CH
	4	-47.2		0	0.31	CL
	5	-51.9		0	0.27	CH
	6	-59.8		0	0.295	CH
	7	-67.9		0	0.46	CH
	8	-9.2	S	34	0	OH
	9	-25.0		20	0	CH
	10	-30.1		32	0	SM
	11	-53.8		26	0	CH



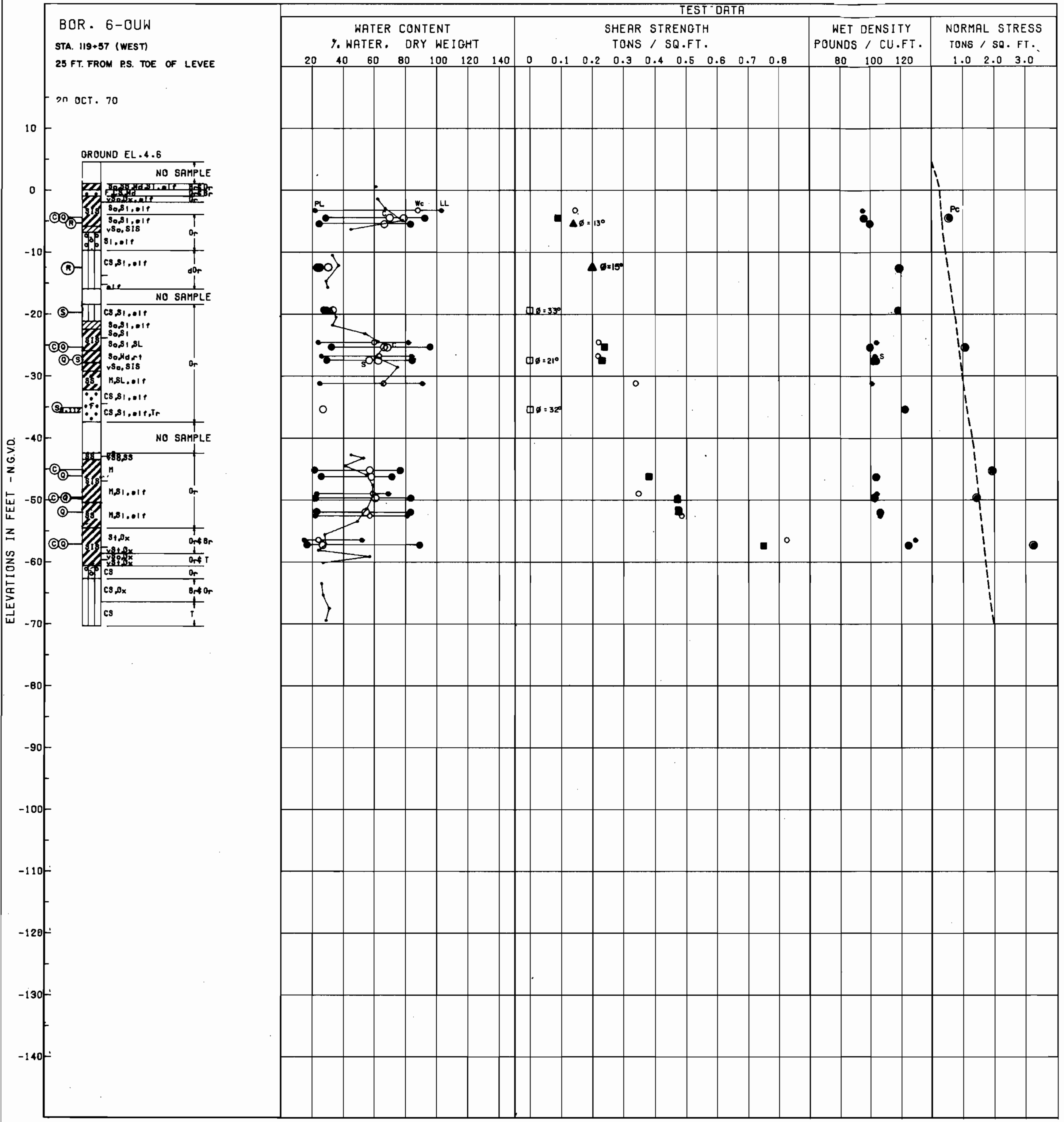
CONSOLIDATION DATA

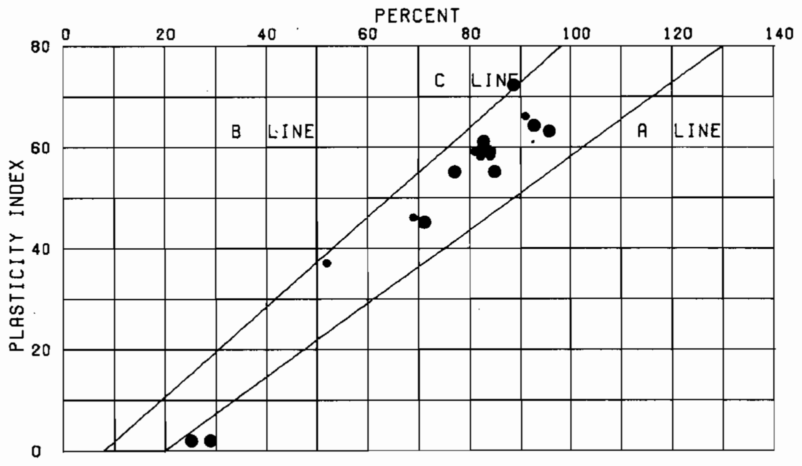
O- (UC) UNCONFINED COMPRESSION TEST
■- (Q) UNCONSOLIDATED - UNDRAINED SHEAR TEST
▲- (R) CONSOLIDATED - UNDRAINED SHEAR TEST
□- (S) CONSOLIDATED - DRAINED SHEAR TEST
BORINGS WERE TAKEN WITH A 5 INCH DIAMETER STEEL TUBE PISTON TYPE SAMPLER
FOR SOIL BORING LEGEND SEE PLATE A
FOR LOCATION OF BORINGS SEE PLATE 12 A

LAKE PONTCHARTRAIN, LA. AND VICINITY
HIGH LEVEL PLAN
DESIGN MEMORANDUM NO. 19 GENERAL DESIGN
ORLEANS AVENUE OUTFALL CANAL

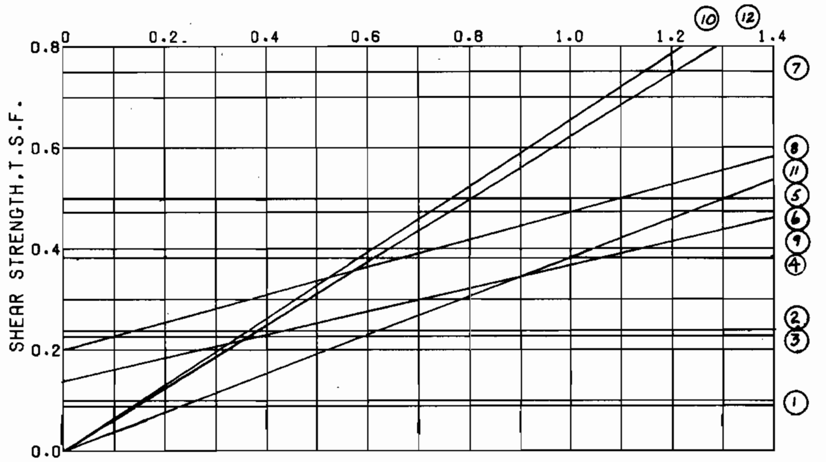
UNDISTURBED BORING NO.5-OUE

U.S. ARMY ENGINEER DISTRICT, NEW ORLEANS
CORPS OF ENGINEERS
JUNE 1988 FILE NO.H-2-30290



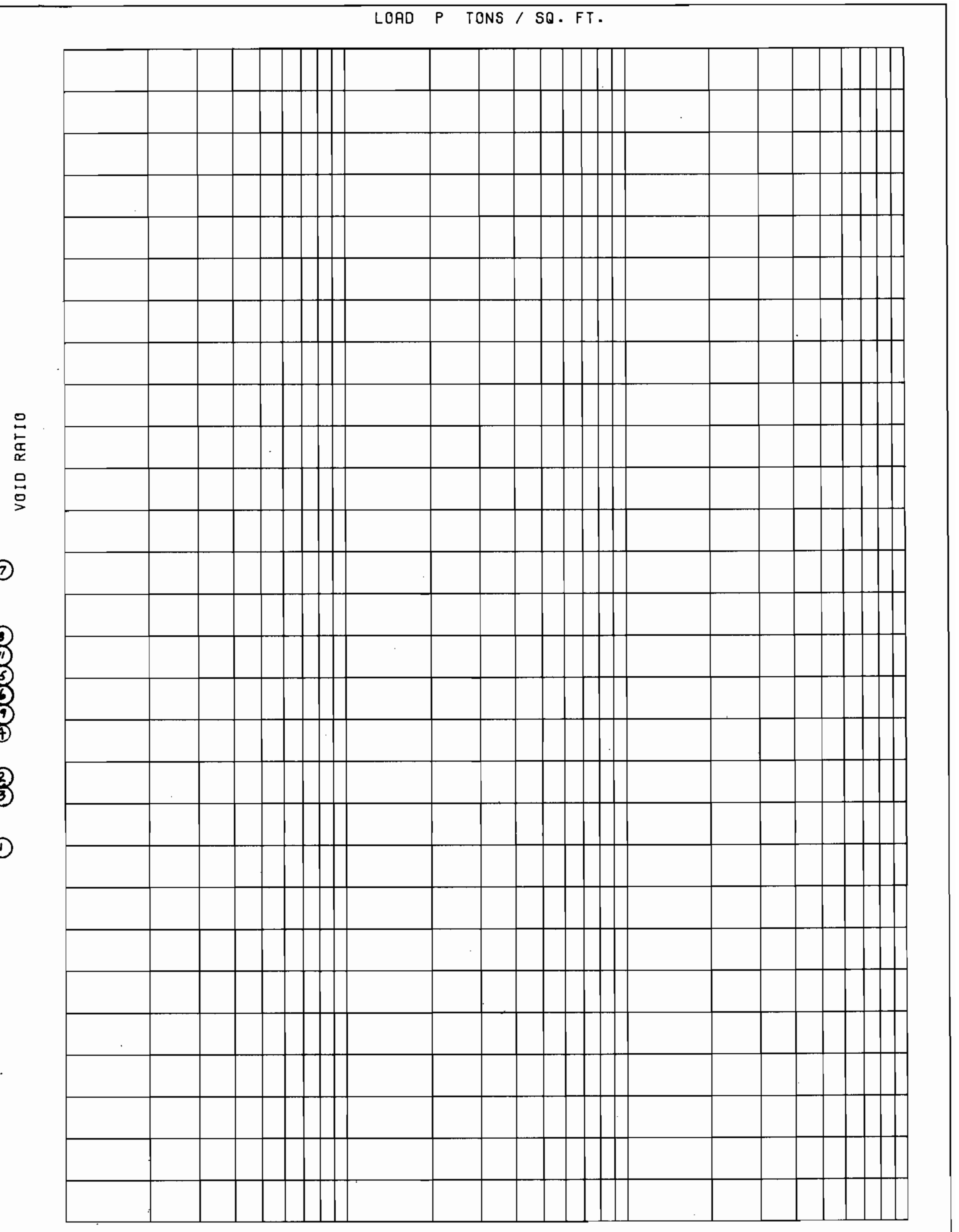


PLASTICITY CHART



SHEAR STRENGTH DATA

ENVELOPE		TYPE	STRENGTH		CLASS
NO.	EL.		Φ	C - TSF	
1	-4.4	↑	↑	0.095	↑
2	-25.2			0.245	
3	-27.4			0.23	
4	-46.0	Q	0	0.38	CH
5	-49.6			0.48	
6	-51.9			0.475	
7	-57.1	↓	↓	0.75	↓
8	-12.6	R	15°	0.20	ML
9	-5.2	R	13°	0.14	CH
10	-19.4	↑	33°	↑	ML
11	-27.4	S	21°	0	CH
12	-35.2	↓	32°	↓	SM



CONSOLIDATION DATA

○ - (U) UNCONFINED COMPRESSION TEST
■ - (Q) UNCONSOLIDATED - UNDRAINED SHEAR TEST
▲ - (R) CONSOLIDATED - UNDRAINED SHEAR TEST
□ - (S) CONSOLIDATED - DRAINED SHEAR TEST

BORINGS WERE TAKEN WITH A 5 INCH DIAMETER STEEL TUBE PISTON TYPE SAMPLER

FOR SOIL BORING LEGEND SEE PLATE A

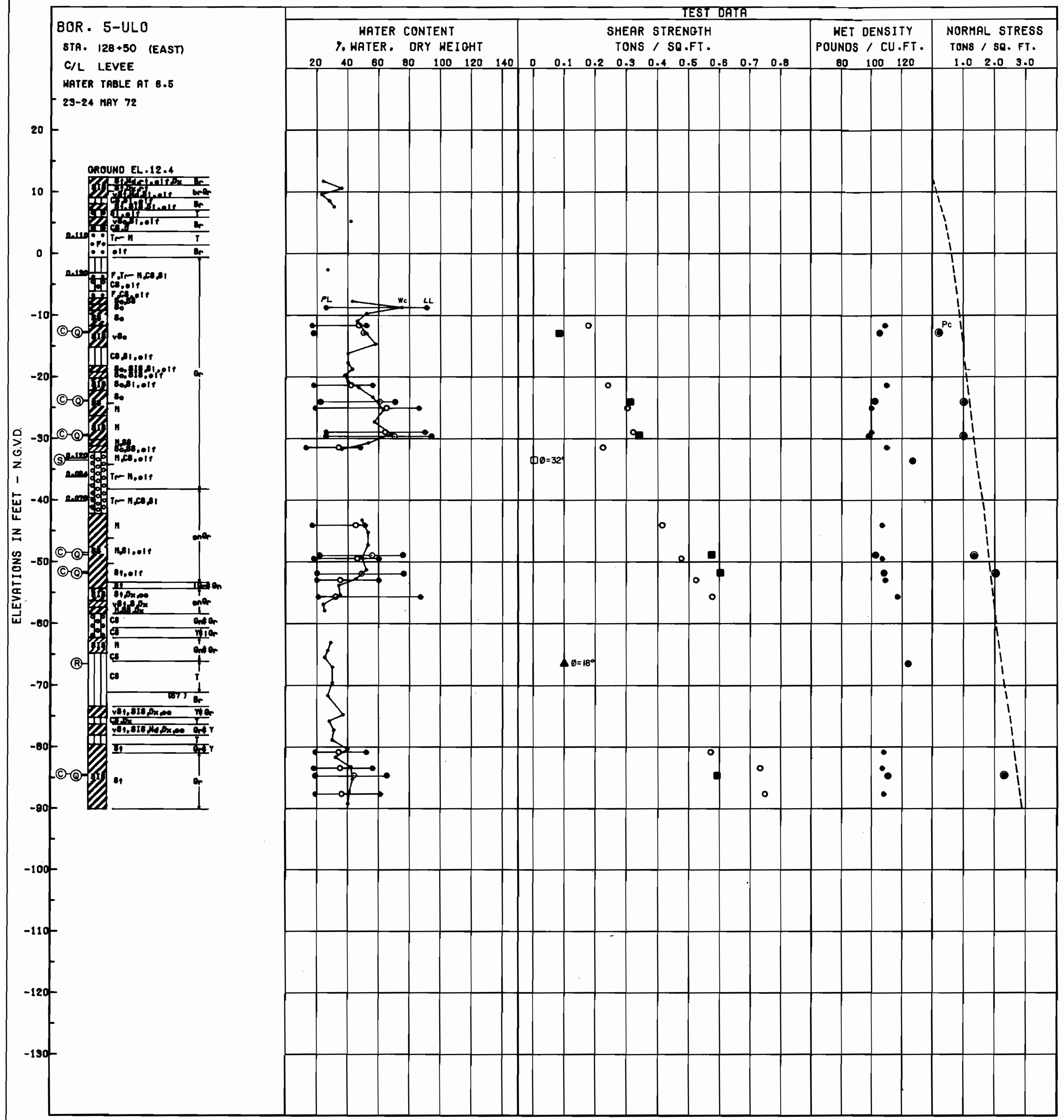
FOR LOCATION OF BORINGS SEE PLATE 12A

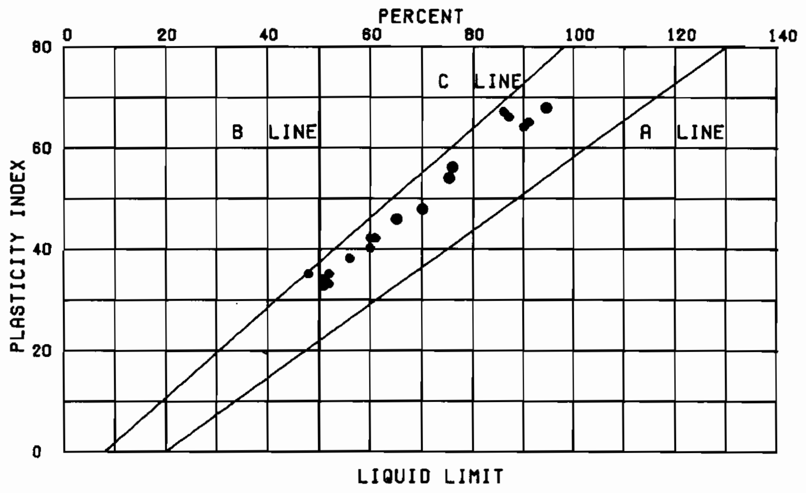
LAKE PONTCHARTRAIN, LA. AND VICINITY
HIGH LEVEL PLAN
DESIGN MEMORANDUM NO. 19 GENERAL DESIGN
ORLEANS AVENUE OUTFALL CANAL

UNDISTURBED BORING NO.6-OUW

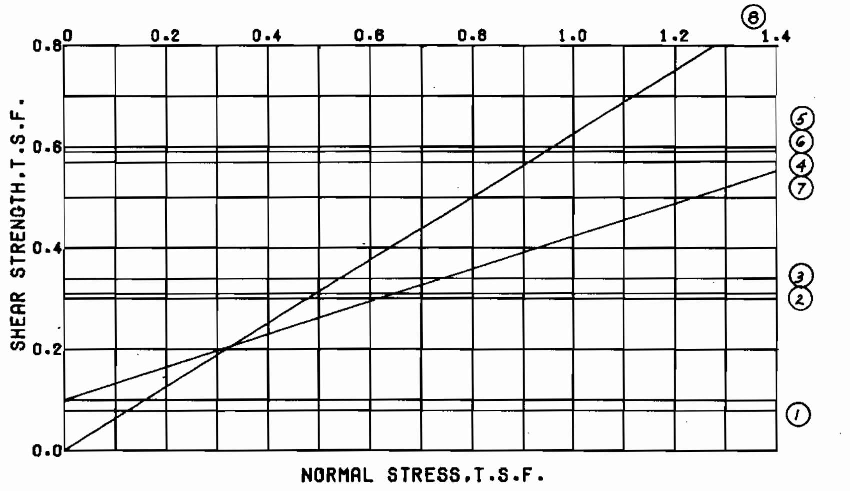
U.S. ARMY ENGINEER DISTRICT, NEW ORLEANS
CORPS OF ENGINEERS

JUNE 1988 FILE NO. H-2-30290



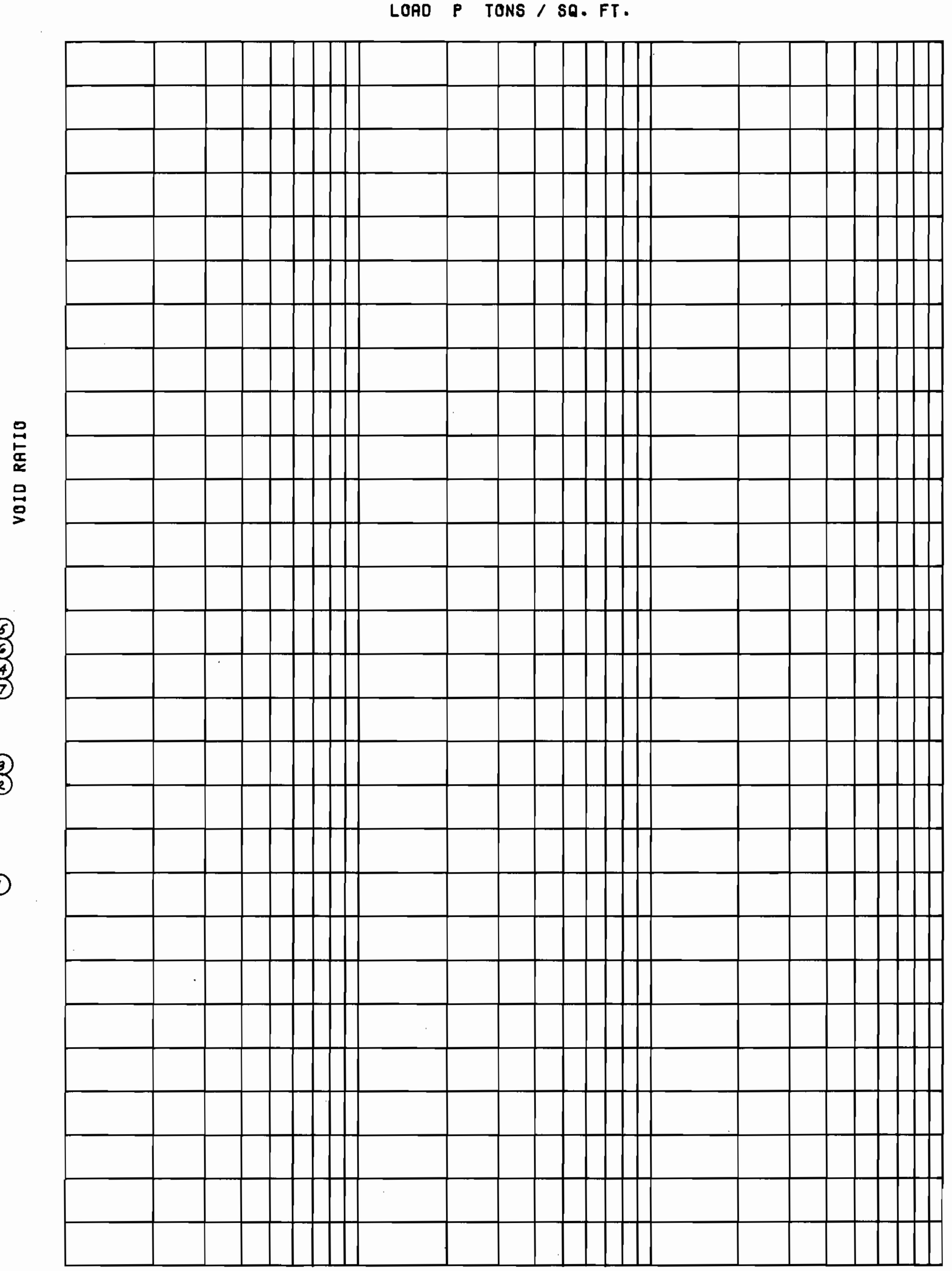


PLASTICITY CHART



SHEAR STRENGTH DATA

ENVELOPE		TYPE	STRENGTH		CLASS
NO.	EL.		Φ	C - TSF	
1	-12.9	Q	0	0.08	CH
2	-24.0	Q	0	0.31	CH
3	-29.7	Q	0	0.34	CH
4	-48.9	Q	0	0.57	CH
5	-51.9	Q	0	0.60	CH
6	-84.7	Q	0	0.59	CH
7	-65.5	R	18°	0.10	SM
8	-33.5	S	32°	0	SM



CONSOLIDATION DATA

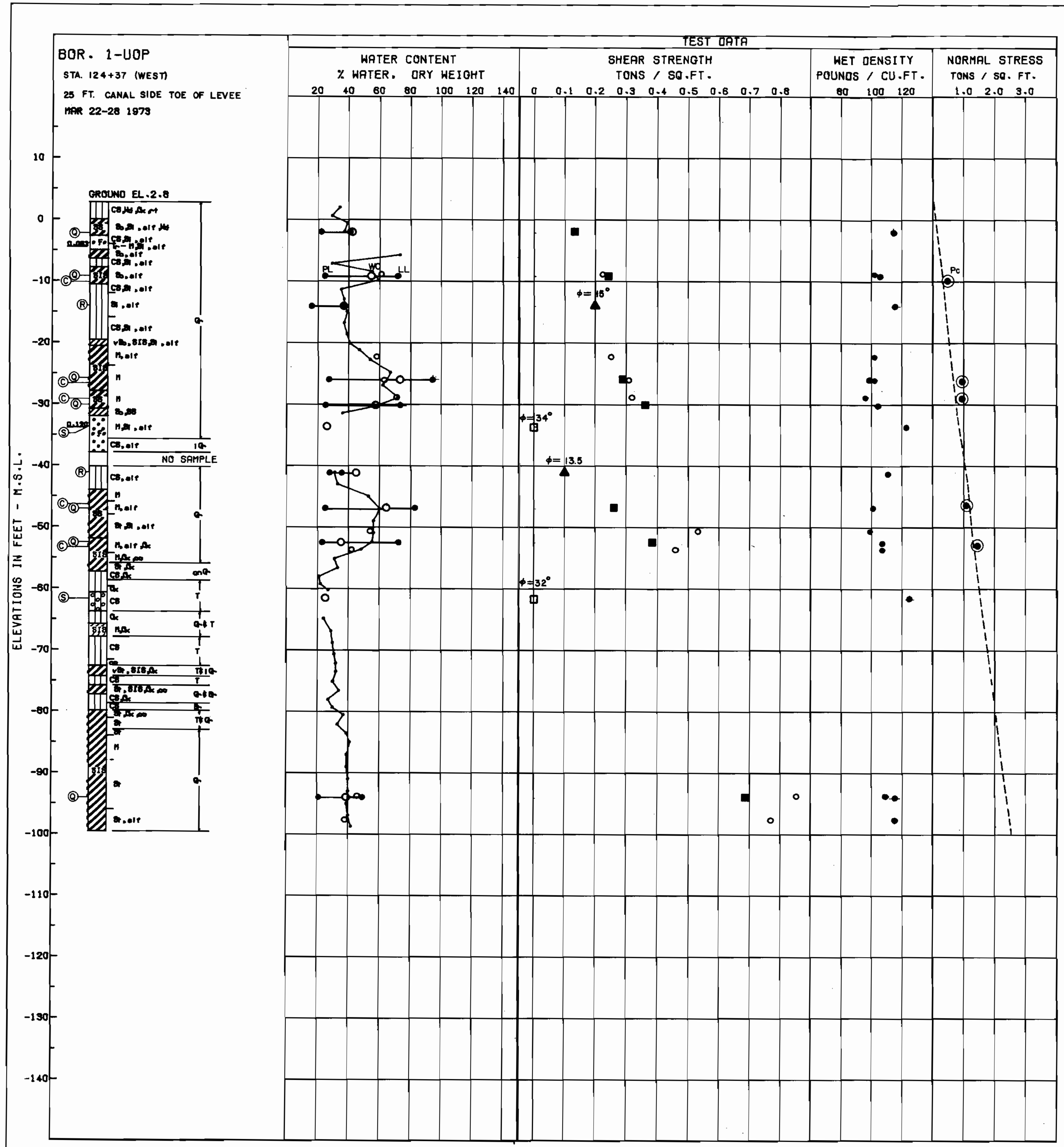
○ - (UC) UNCONFINED COMPRESSION TEST
■ - (Q) UNCONSOLIDATED - UNDRAINED SHEAR TEST
▲ - (R) CONSOLIDATED - UNDRAINED SHEAR TEST
□ - (S) CONSOLIDATED - DRAINED SHEAR TEST
BORINGS WERE TAKEN WITH A 5 INCH DIAMETER STEEL TUBE PISTON TYPE SAMPLER
FOR SOIL BORING LEGEND SEE PLATE A
FOR LOCATION OF BORINGS SEE PLATE 12A

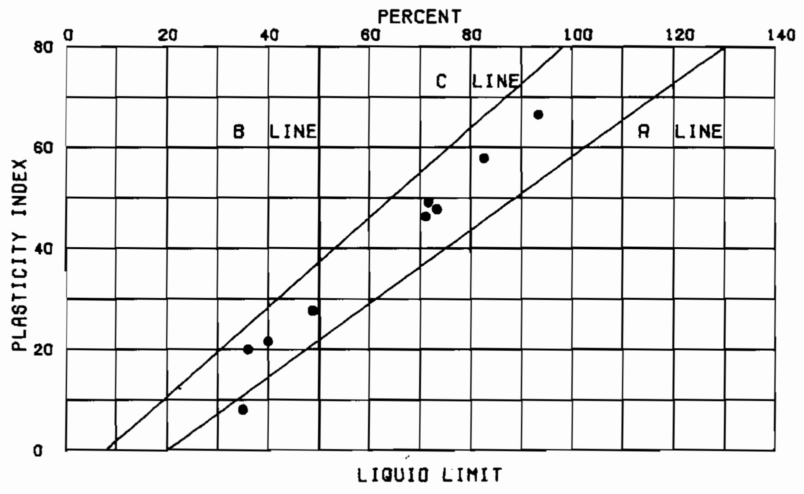
LAKE PONTCHARTRAIN, LA. AND VICINITY
HIGH LEVEL PLAN
DESIGN MEMORANDUM NO. 19 GENERAL DESIGN
ORLEANS AVENUE OUTFALL CANAL

UNDISTURBED BORING NO. 5-ULO

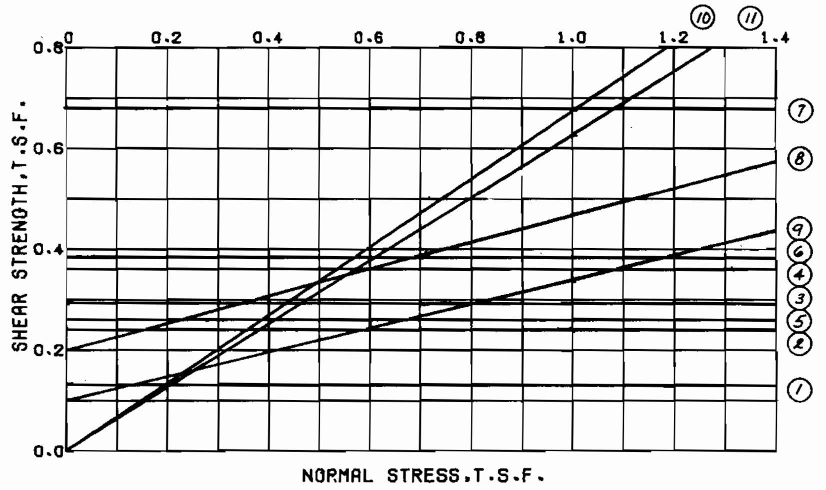
U.S. ARMY ENGINEER DISTRICT, NEW ORLEANS
CORPS OF ENGINEERS

JUNE 1988 FILE NO. H-2-30290



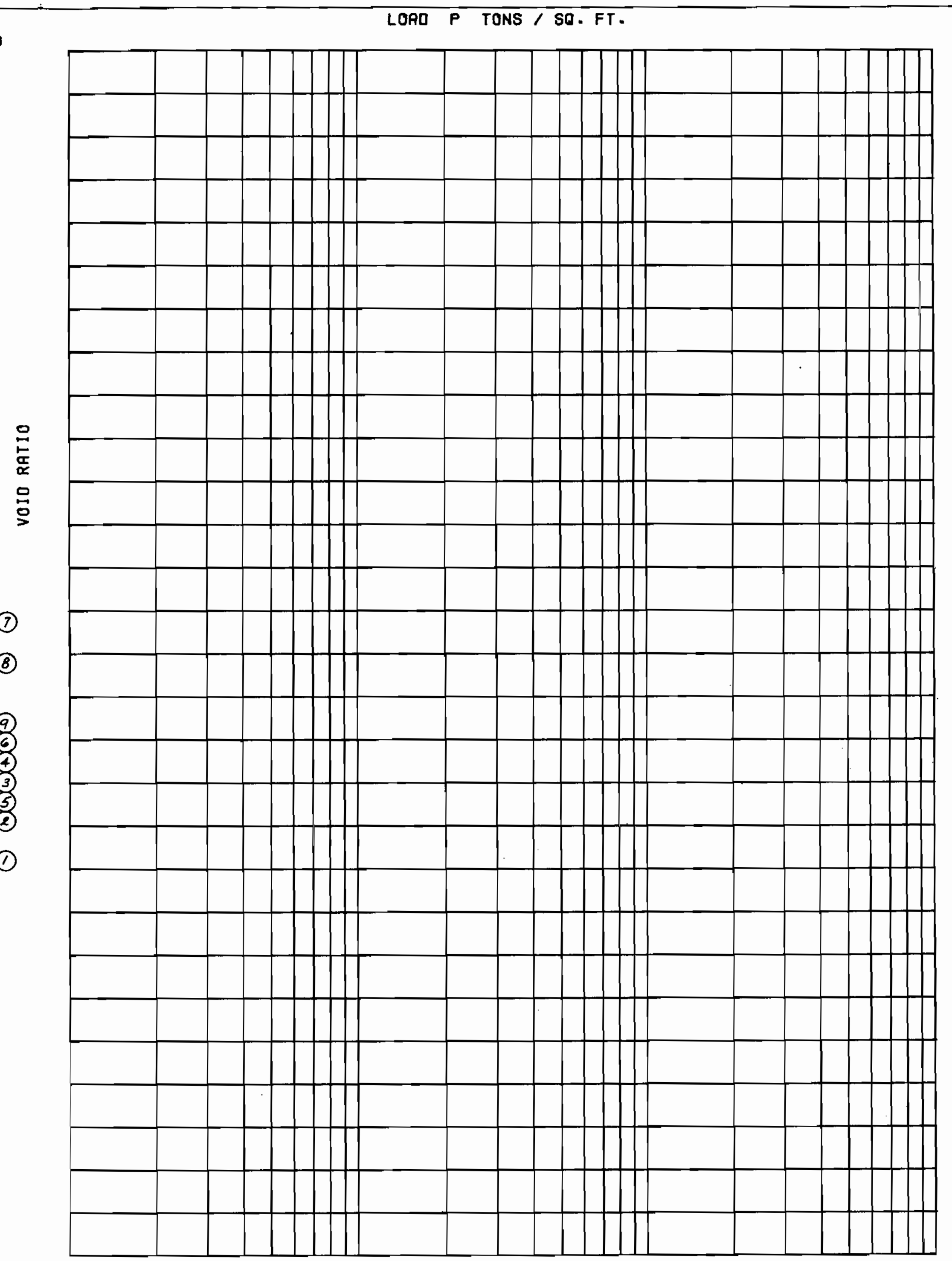


PLASTICITY CHART



SHEAR STRENGTH DATA

ENVELOPE		TYPE	STRENGTH		CLASS
NO.	EL.		$\Phi°$	C - TSF	
1	-2.1	Q	0	0.13	CL
2	-9.2		0	0.24	CH
3	-26.9		0	0.29	CH
4	-30.1		0	0.36	CH
5	-47.0		0	0.26	CH
6	-52.6		0	0.38	CH
7	-94.1		0	0.68	CL
8	-14.0	R	15	0.20	CL
9	-41.2		13.5	0.10	ML
10	-33.6	S	34	0.0	SM
11	-61.8		32	0.0	SM



CONSOLIDATION DATA

- o - (UC) UNCONFINED COMPRESSION TEST
- ■ - (Q) UNCONSOLIDATED - UNDRAINED SHEAR TEST
- ▲ - (R) CONSOLIDATED - UNDRAINED SHEAR TEST
- □ - (S) CONSOLIDATED - DRAINED SHEAR TEST

BORINGS WERE TAKEN WITH A 5 INCH DIAMETER STEEL TUBE PISTON TYPE SAMPLER

FOR SOIL BORING LEGEND SEE PLATE A

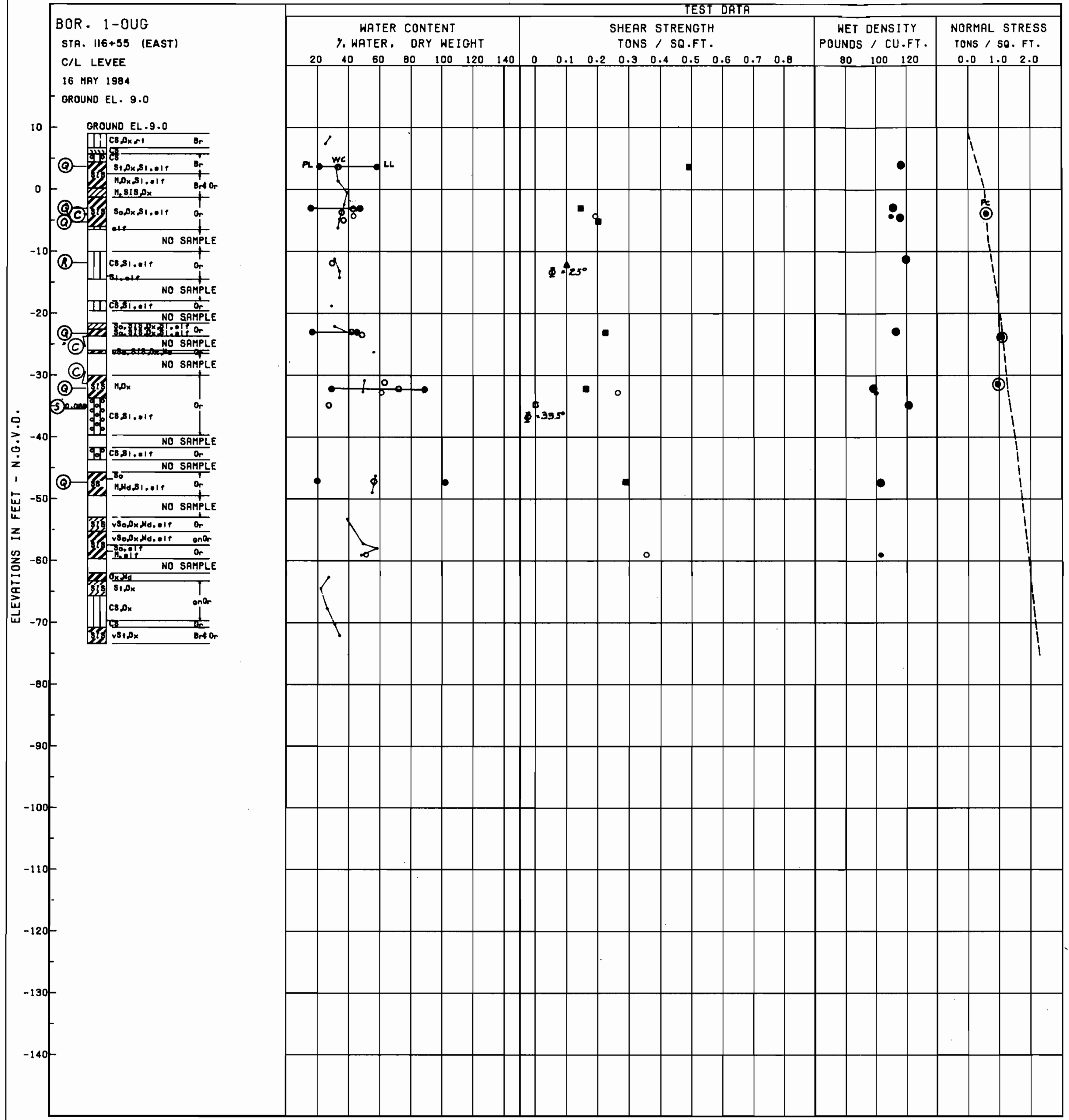
FOR LOCATION OF BORINGS SEE PLATE 12A

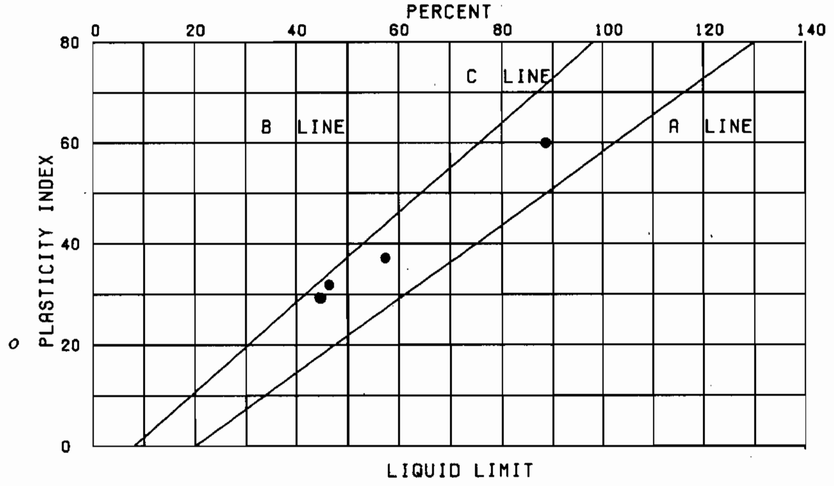
LAKE PONTCHARTRAIN, LA. AND VICINITY
HIGH LEVEL PLAN
DESIGN MEMORANDUM NO. 19 GENERAL DESIGN
ORLEANS AVENUE OUTFALL CANAL

UNDISTURBED BORING NO. 1-UOP

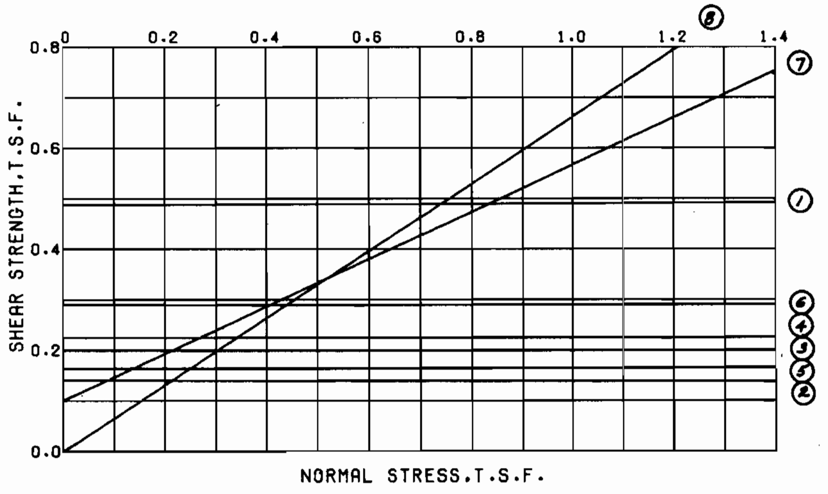
U.S. ARMY ENGINEER DISTRICT, NEW ORLEANS
CORPS OF ENGINEERS

JUNE 1988 FILE NO. H-2-30290



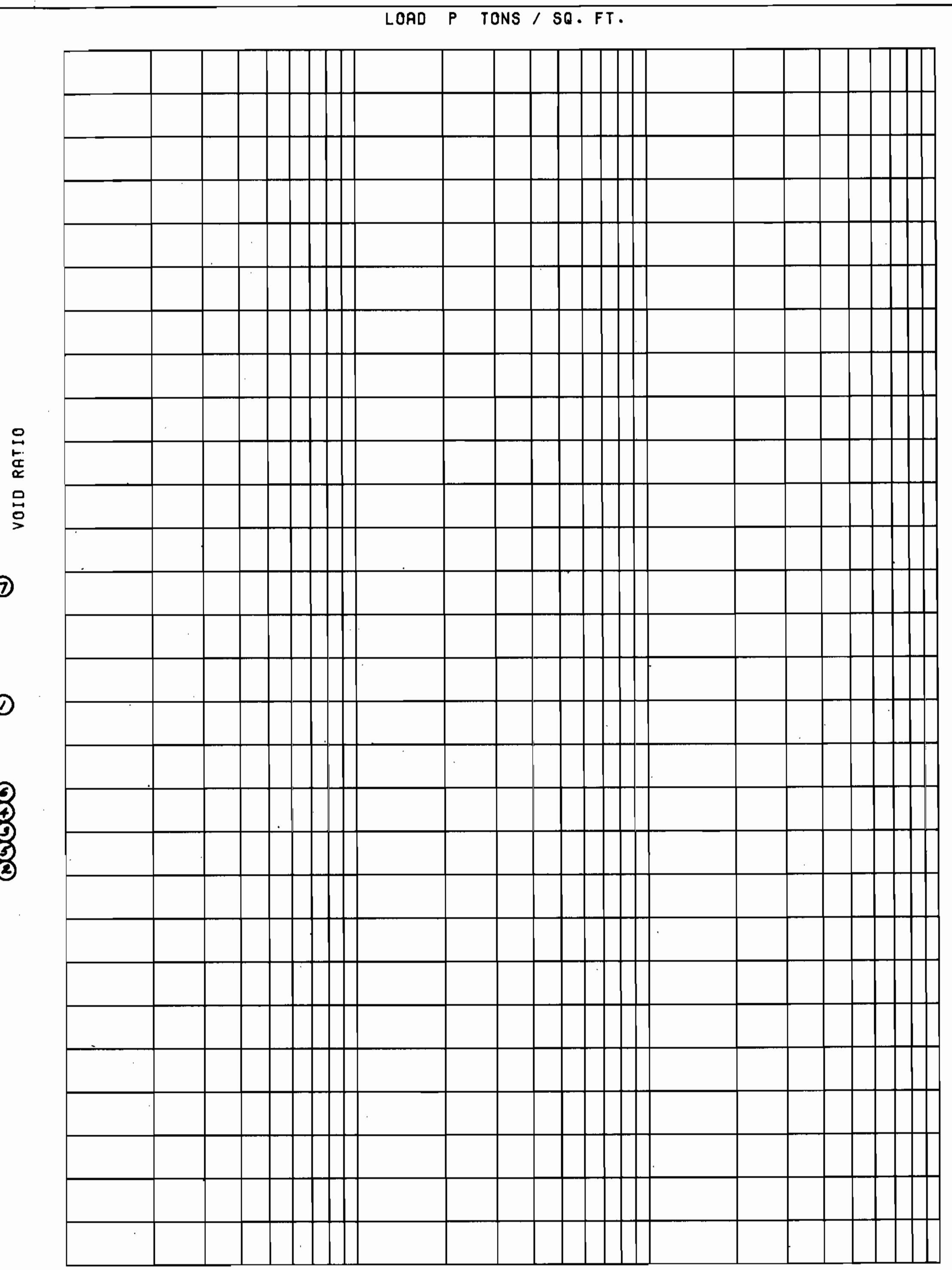


PLASTICITY CHART



SHEAR STRENGTH DATA

ENVELOPE		TYPE	STRENGTH		CLASS
NO.	EL.		Φ	C - TSF	
1.	+3.6	Q	0°	0.49	CH
2.	-3.1	Q	0°	0.145	CL
3.	-5.1	Q	0°	0.20	CH
4.	-23.2	Q	0°	0.225	CL
5.	-32.3	Q	0°	0.165	CH
6.	-47.4	Q	0°	0.29	CH
7.	-12.0	R	25°	0.10	ML
8.	-35.0	S	33.5°	0	SM



CONSOLIDATION DATA

○ - (UC) UNCONFINED COMPRESSION TEST
■ - (Q) UNCONSOLIDATED - UNDRAINED SHEAR TEST
▲ - (R) CONSOLIDATED - UNDRAINED SHEAR TEST
□ - (S) CONSOLIDATED - DRAINED SHEAR TEST

BORINGS WERE TAKEN WITH A 5 INCH DIAMETER STEEL TUBE PISTON TYPE SAMPLER

FOR SOIL BORING LEGEND SEE PLATE A

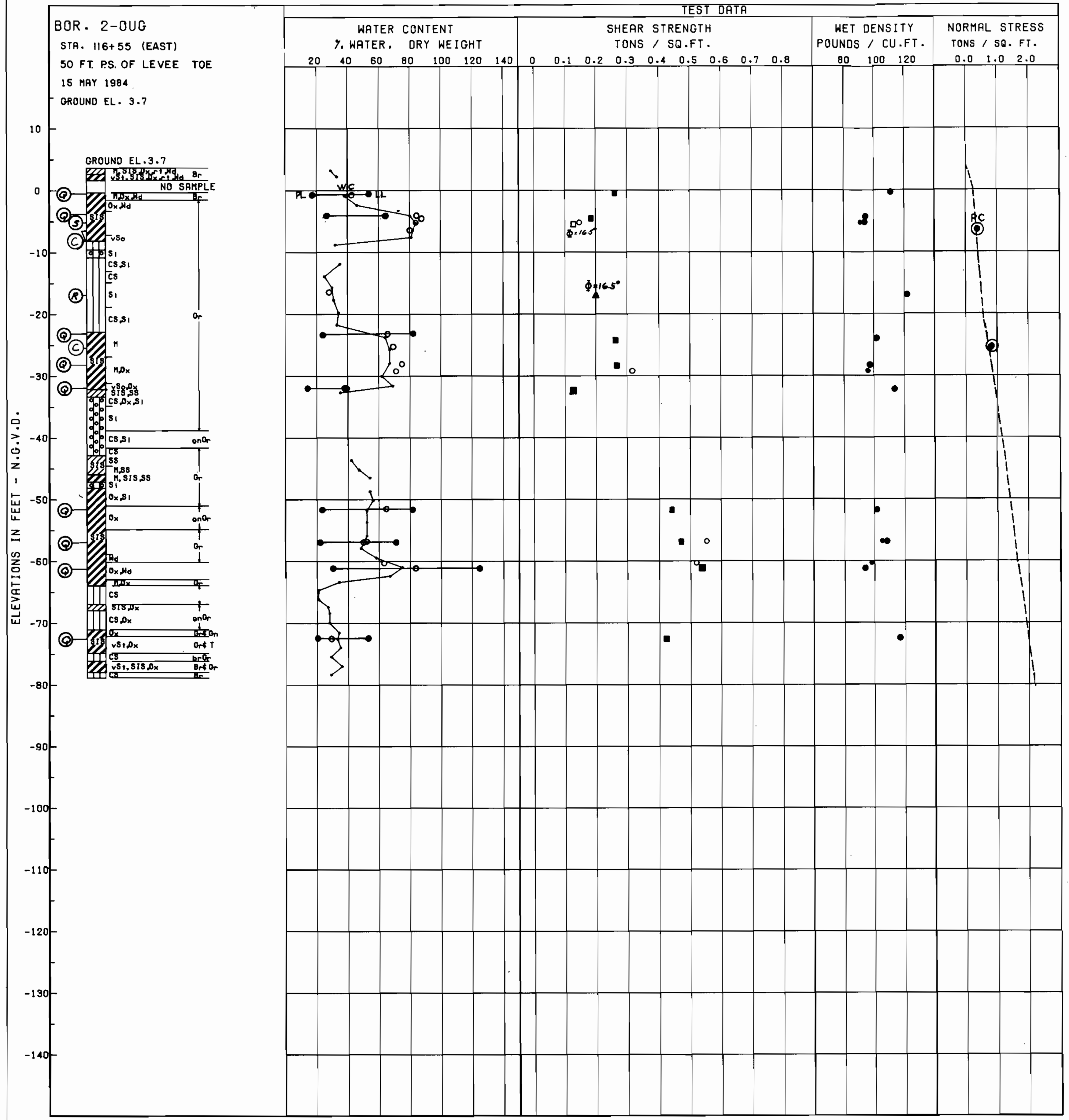
FOR LOCATION OF BORING SEE PLATE 12A

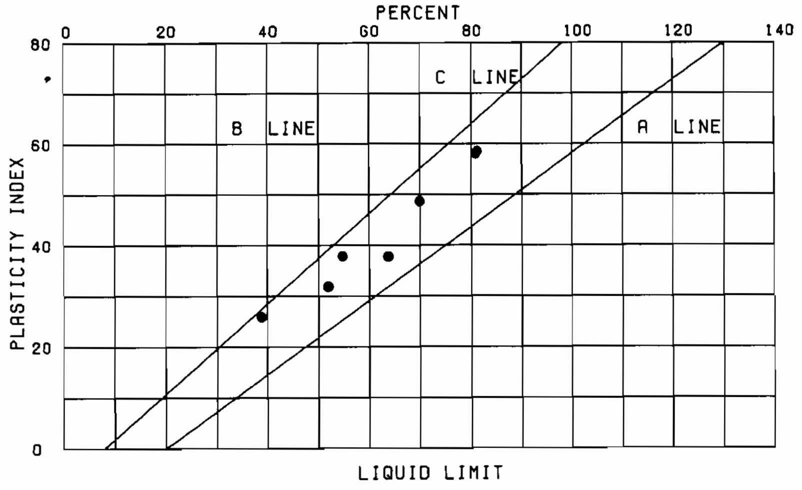
LAKE PONTCHARTRAIN, LA. AND VICINITY
HIGH LEVEL PLAN
DESIGN MEMORANDUM NO. 19 GENERAL DESIGN
ORLEANS AVENUE OUTFALL CANAL

UNDISTURBED BORING NO. 1-OUG

U.S. ARMY ENGINEER DISTRICT, NEW ORLEANS
CORPS OF ENGINEERS

JUNE 1988 FILE NO. H-2-30290





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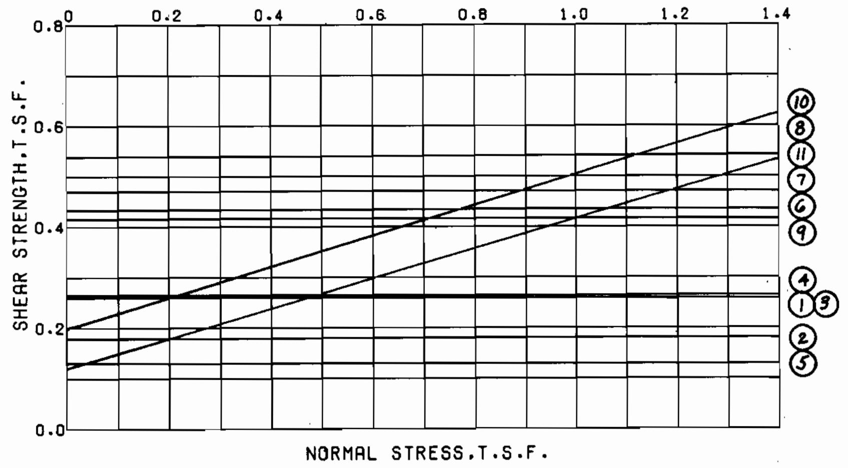
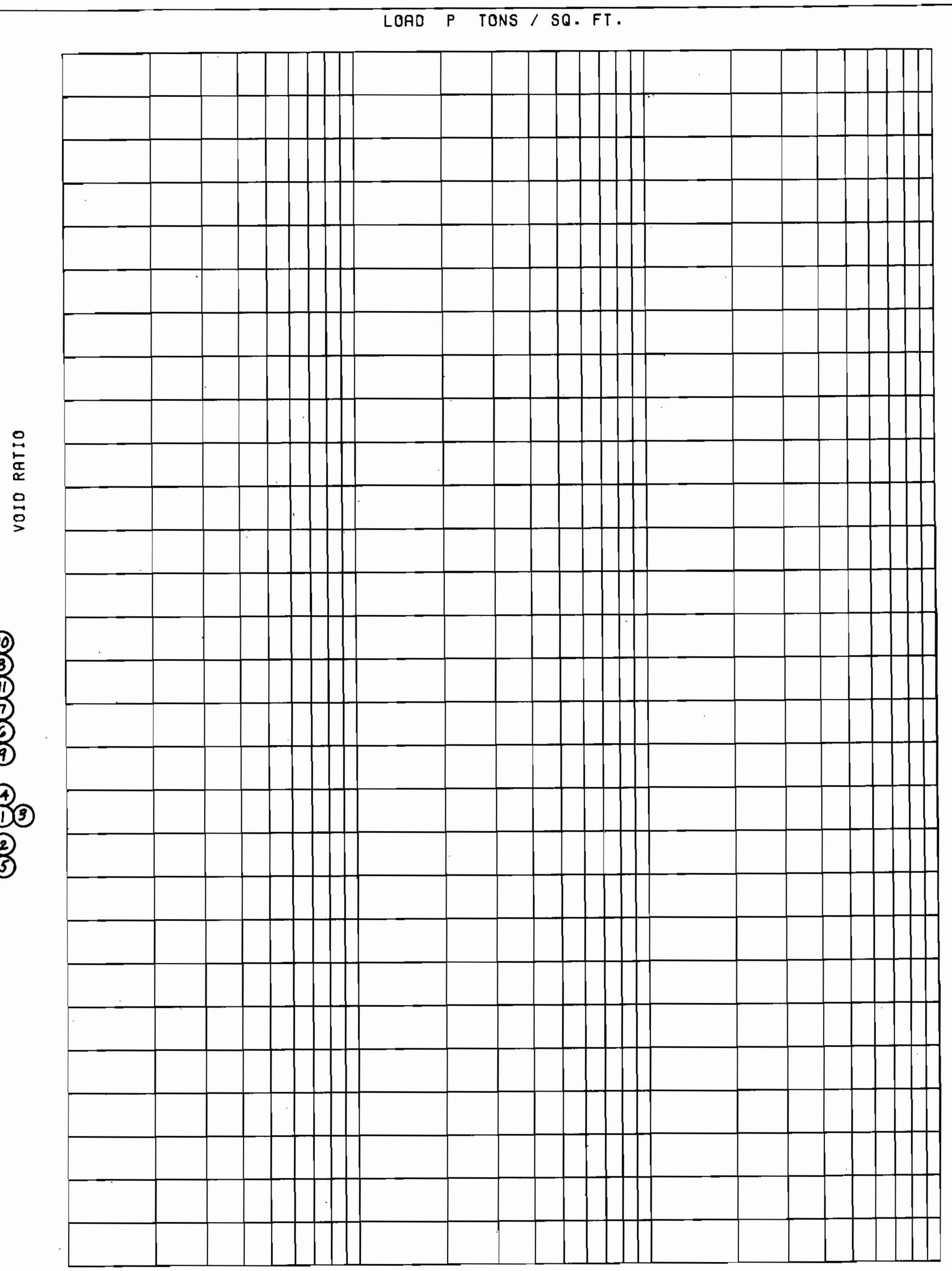


SHEAR STRENGTH DATA

ENVELOPE NO.	EL.	TYPE	STRENGTH Φ	C -- TSF	CLASS
1.	-0.8	Q	0°	0.26	CH
2.	-4.4	Q	0°	0.18	CH
3.	-24.4	Q	0°	0.26	CH
4.	-28.5	Q	0°	0.265	CH
5.	-32.3	Q	0°	0.13	CL
6.	-52.0	Q	0°	0.435	CH
7.	-57.3	Q	0°	0.47	CH
8.	-61.3	Q	0°	0.54	CH
9.	-72.7	Q	0°	0.415	CH
10.	-17.3	R	16.5°	0.20	ML
11.	-5.6	S	16.5°	0.125	CH



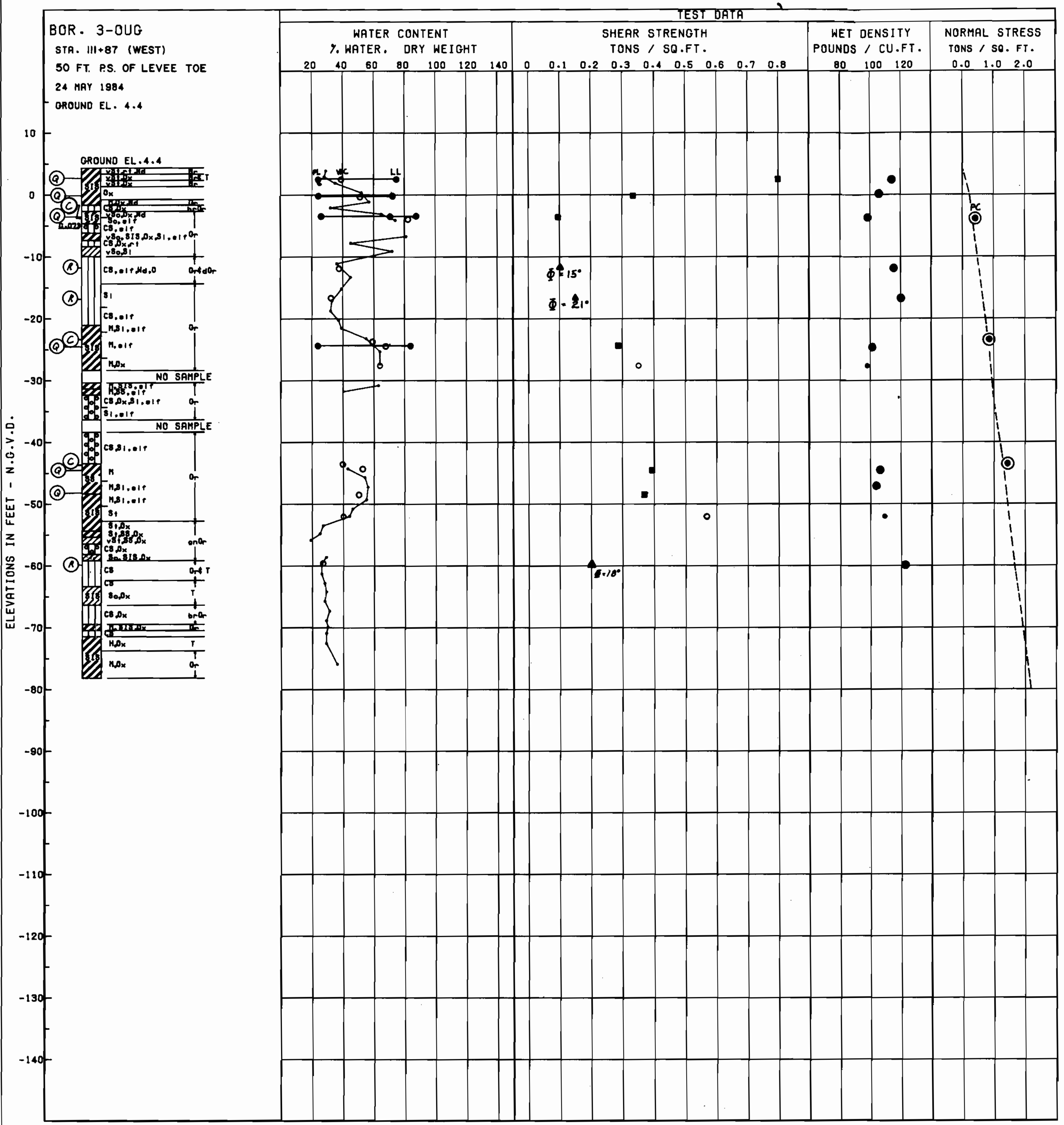
CONSOLIDATION DATA

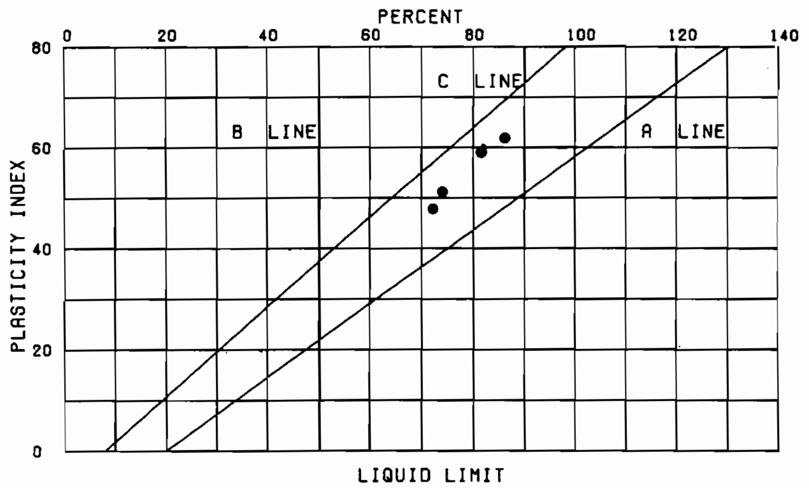
○ - (UC) UNCONFINED COMPRESSION TEST
■ - (Q) UNCONSOLIDATED - UNDRAINED SHEAR TEST
▲ - (R) CONSOLIDATED - UNDRAINED SHEAR TEST
□ - (S) CONSOLIDATED - DRAINED SHEAR TEST
BORINGS WERE TAKEN WITH A 5 INCH DIAMETER STEEL TUBE PISTON TYPE SAMPLER
FOR SOIL BORING LEGEND SEE PLATE A
FOR LOCATION OF BORING SEE PLATE 12A

LAKE PONTCHARTRAIN, LA. AND VICINITY
HIGH LEVEL PLAN
DESIGN MEMORANDUM NO. 19 GENERAL DESIGN
ORLEANS AVENUE OUTFALL CANAL

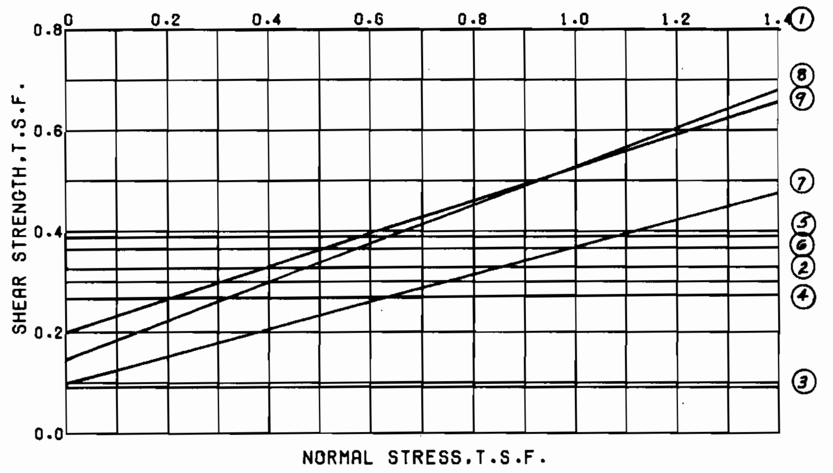
UNDISTURBED BORING NO. 2-OUG

U.S. ARMY ENGINEER DISTRICT, NEW ORLEANS
CORPS OF ENGINEERS
JUNE 1988 FILE NO. H-2-30290



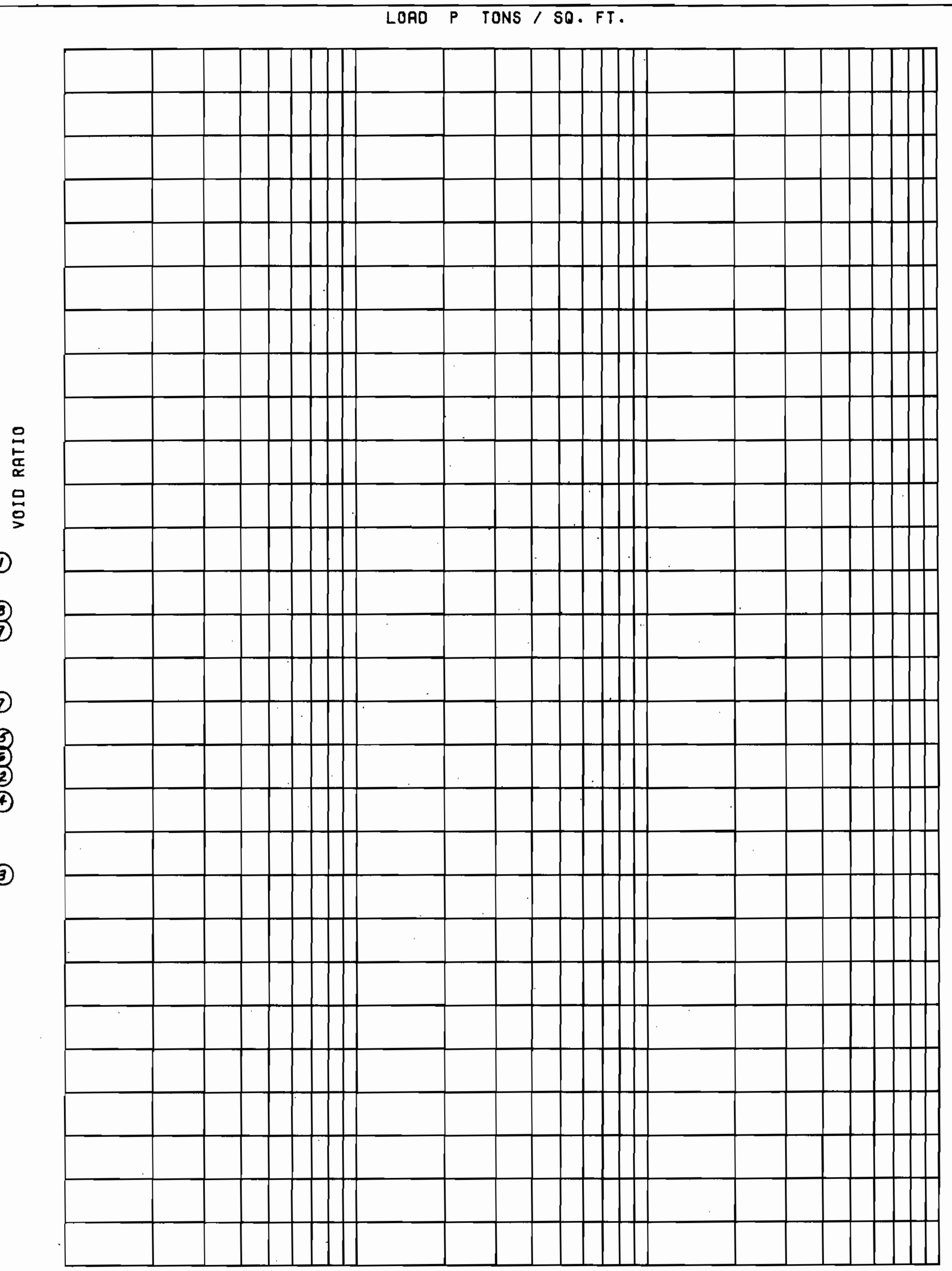


PLASTICITY CHART



SHEAR STRENGTH DATA

ENVELOPE		TYPE	STRENGTH		CLASS
NO.	EL.		Φ	C - TSF	
1.	+2.4	Q	0°	0.80	CH
2.	-0.1	Q	0°	0.33	CH
3.	-3.6	Q	0°	0.095	CH
4.	-24.6	Q	0°	0.285	CH
5.	-44.6	Q	0°	0.39	CH
6.	-48.6	Q	0°	0.365	CH
7.	-11.9	R	15°	0.10	ML
8.	-16.6	R	21°	0.15	ML
9.	-59.8	R	18°	0.20	ML



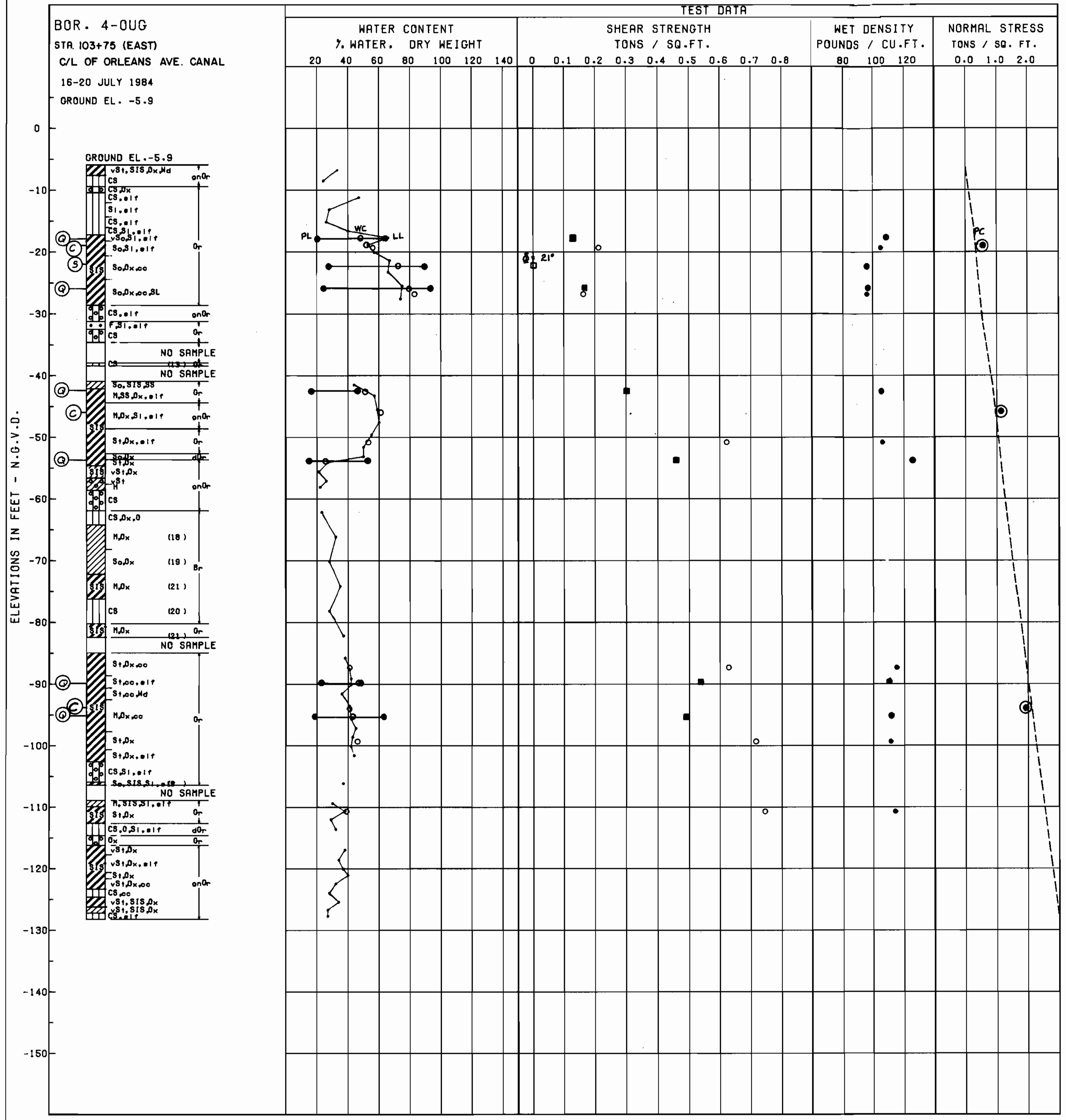
CONSOLIDATION DATA

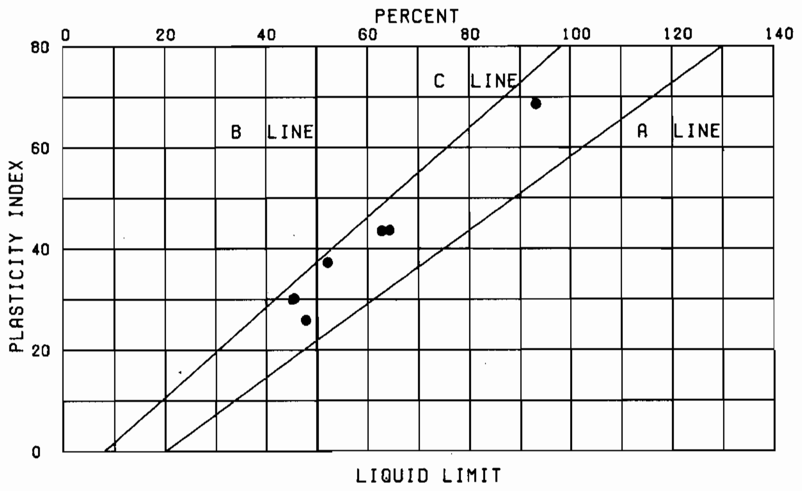
○ - (UC) UNCONFINED COMPRESSION TEST
■ - (Q) UNCONSOLIDATED - UNDRAINED SHEAR TEST
▲ - (R) CONSOLIDATED - UNDRAINED SHEAR TEST
□ - (S) CONSOLIDATED - DRAINED SHEAR TEST
BORINGS WERE TAKEN WITH A 5 INCH DIAMETER STEEL TUBE PISTON TYPE SAMPLER
FOR SOIL BORING LEGEND SEE PLATE A
FOR LOCATION OF BORING SEE PLATE 12A

LAKE PONTCHARTRAIN, LA. AND VICINITY
HIGH LEVEL PLAN
DESIGN MEMORANDUM NO. 19 GENERAL DESIGN
ORLEANS AVENUE OUTFALL CANAL

UNDISTURBED BORING NO. 3-OUG

U.S. ARMY ENGINEER DISTRICT, NEW ORLEANS
CORPS OF ENGINEERS
JUNE 1988 FILE NO. H-2-30290





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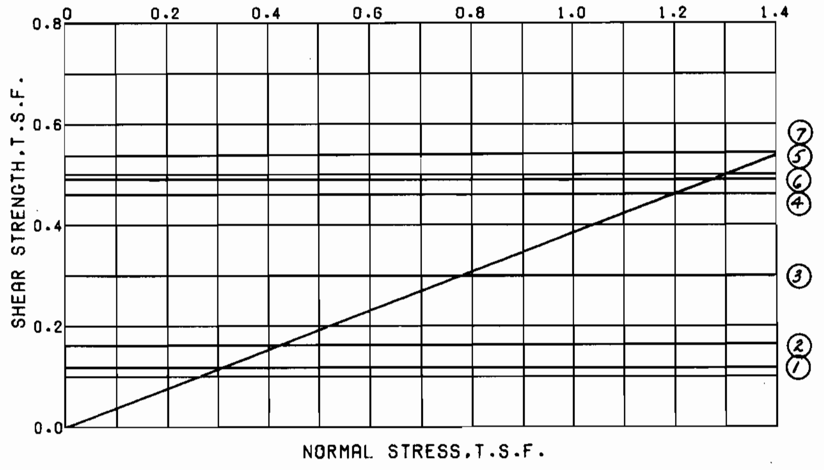
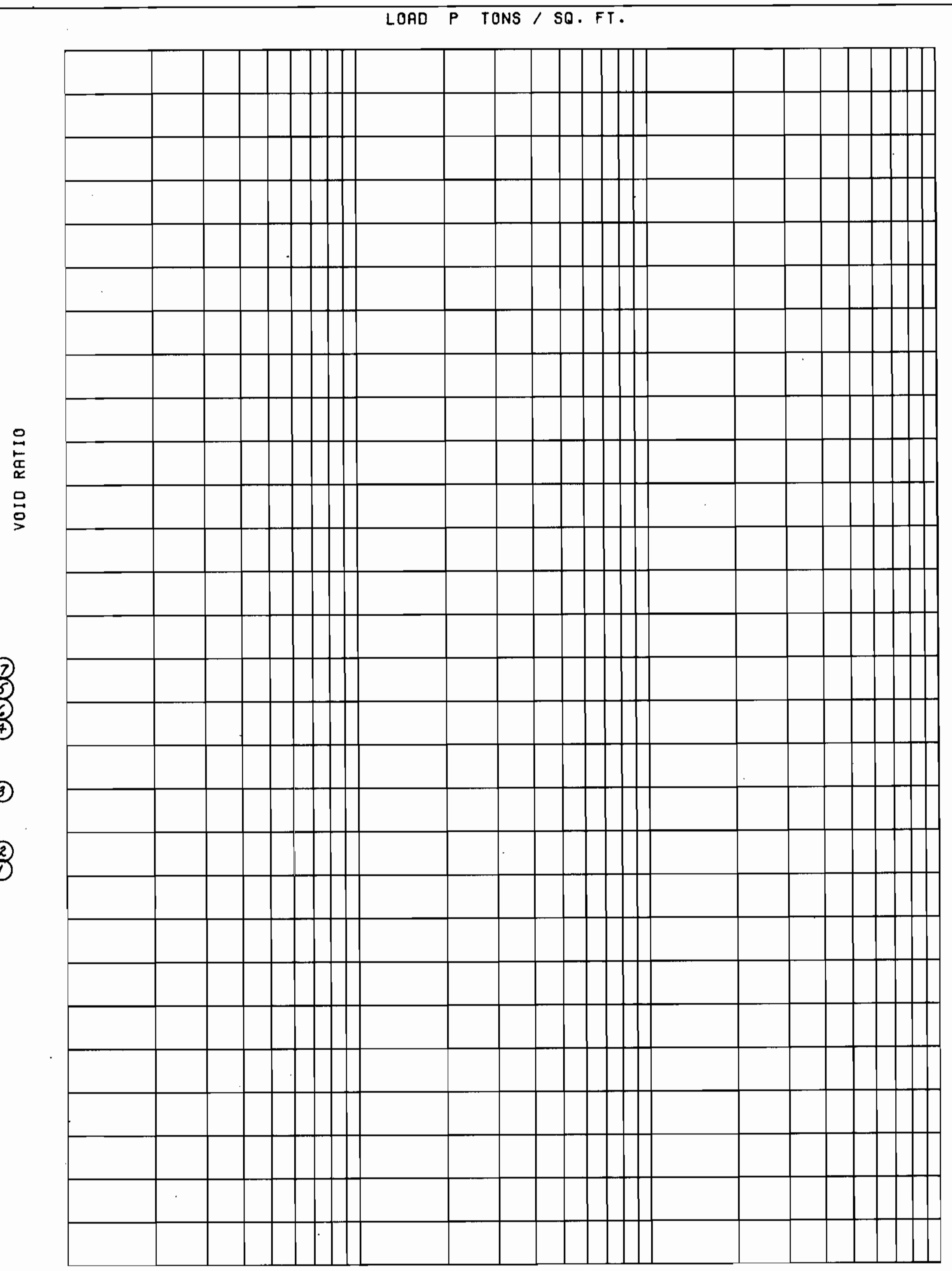


SHEAR STRENGTH DATA

ENVELOPE		TYPE	STRENGTH		CLASS
NO.	EL.		Φ	C - TSF	
1.	-17.9	Q	0°	0.12	CH
2.	-25.9	Q	0°	0.165	CH
3.	-42.4	Q	0°	0.30	CH
4.	-53.9	Q	0°	0.46	CH
5.	-89.9	Q	0°	0.54	CH
6.	-95.2	Q	0°	0.49	CH
7.	-22.3	S	21°	0.0	CH



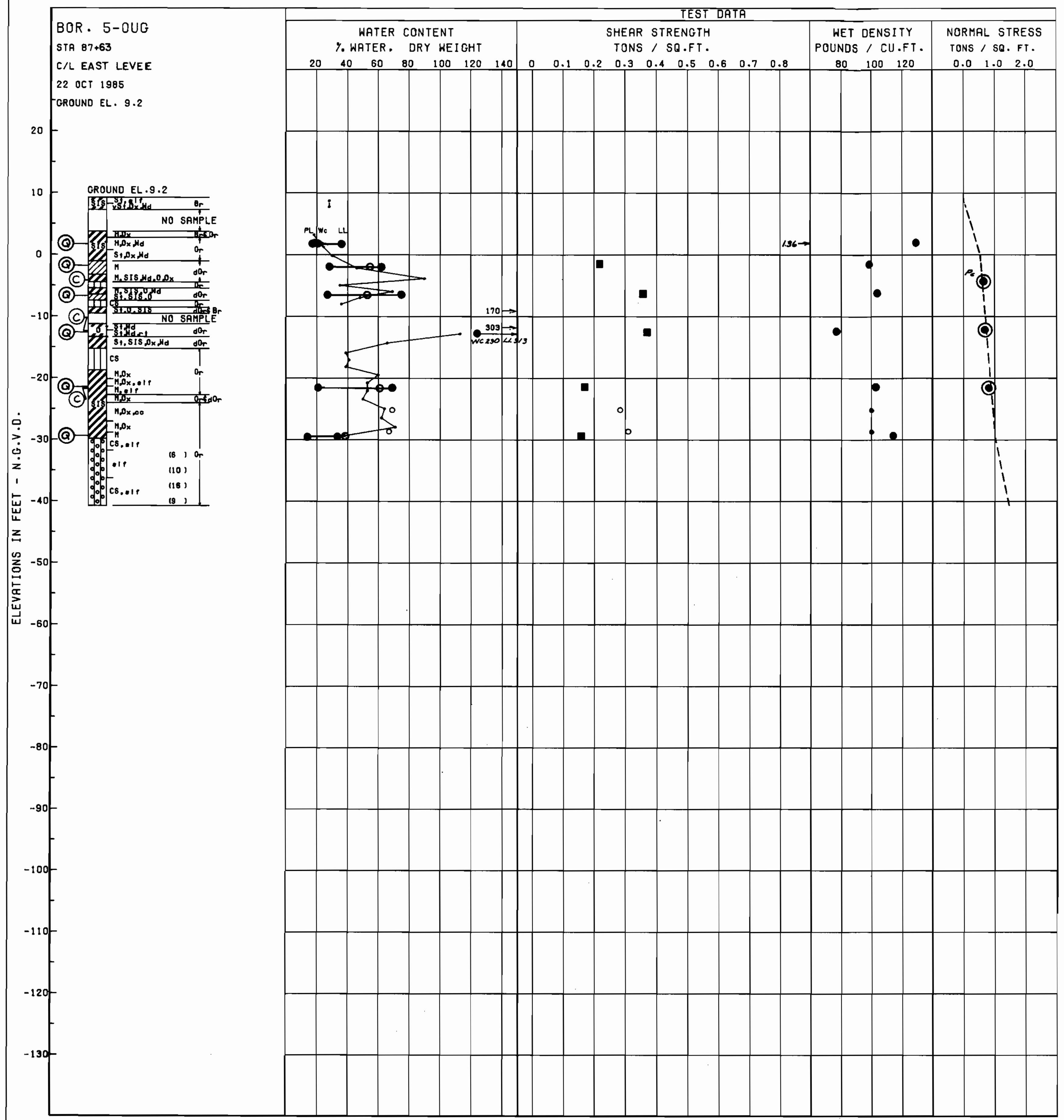
CONSOLIDATION DATA

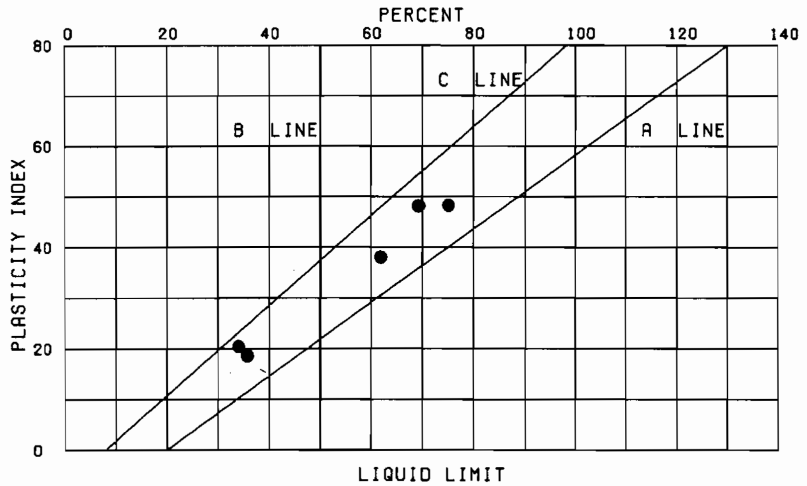
○ - (UC) UNCONFINED COMPRESSION TEST
■ - (Q) UNCONSOLIDATED - UNDRAINED SHEAR TEST
▲ - (R) CONSOLIDATED - UNDRAINED SHEAR TEST
□ - (S) CONSOLIDATED - DRAINED SHEAR TEST
BORINGS WERE TAKEN WITH A 5 INCH DIAMETER STEEL TUBE PISTON TYPE SAMPLER
FOR SOIL BORING LEGEND SEE PLATE A
FOR LOCATION OF BORING SEE PLATE 12A

LAKE PONTCHARTRAIN, LA. AND VICINITY
HIGH LEVEL PLAN
DESIGN MEMORANDUM NO. 19 GENERAL DESIGN
ORLEANS AVENUE OUTFALL CANAL

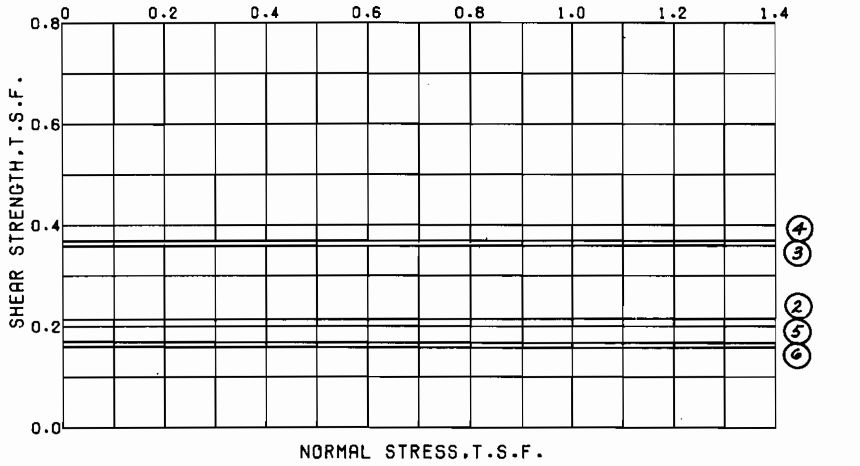
UNDISTURBED BORING NO. 4-OUG

U.S. ARMY ENGINEER DISTRICT, NEW ORLEANS
CORPS OF ENGINEERS
JUNE 1988 FILE NO. H-2-30290



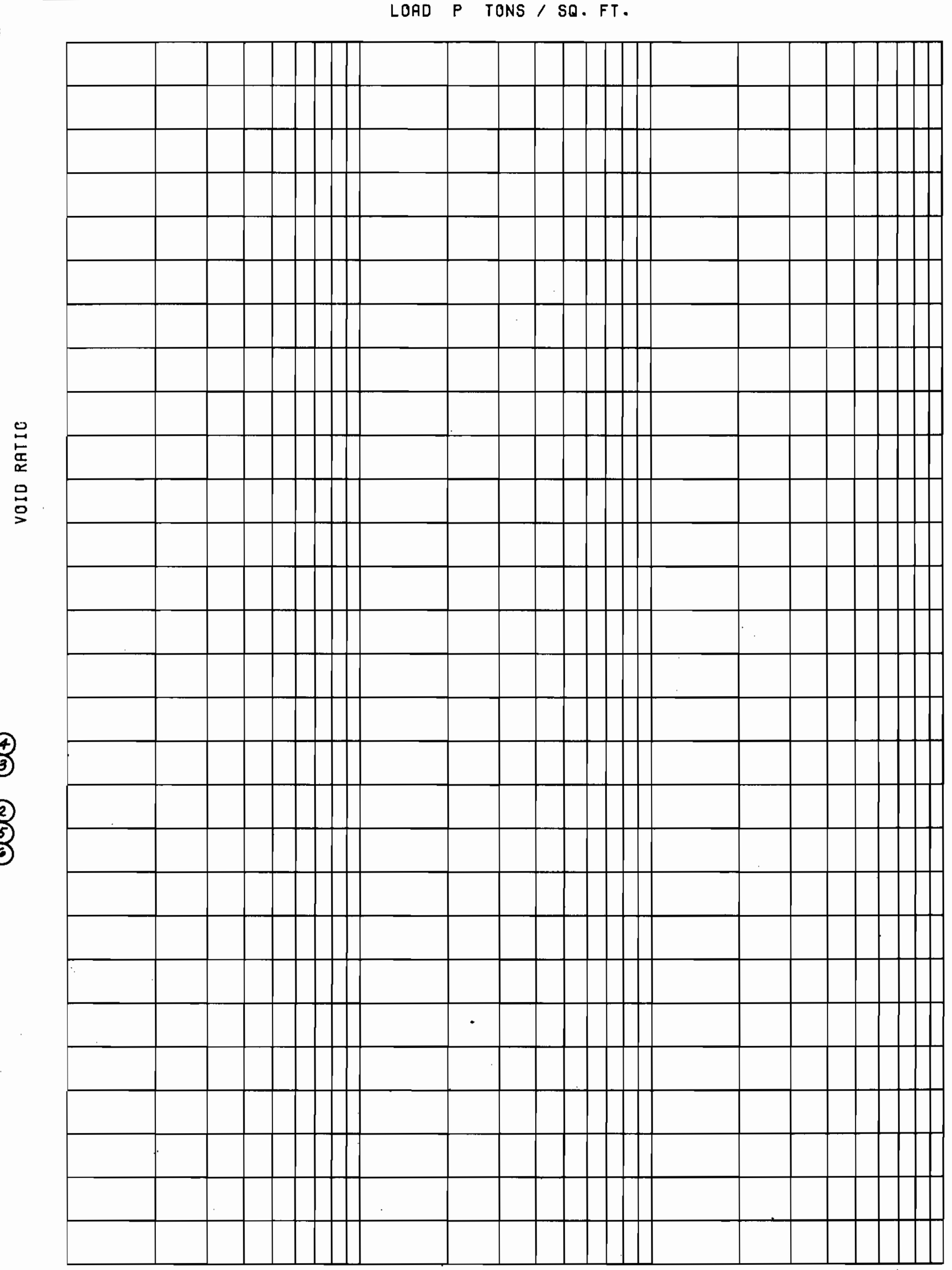


PLASTICITY CHART



SHEAR STRENGTH DATA

ENVELOPE		TYPE	STRENGTH		CLASS
NO.	EL.		Φ	C - TSF	
1.	+1.9	Q	0	1.360	CL
2.	-1.8	Q	0	0.215	CH
3.	-6.1	Q	0	0.360	CH
4.	-12.3	Q	0	0.370	OH
5.	-21.1	Q	0	0.170	CH
6.	-29.4	Q	0	0.160	CL



CONSOLIDATION DATA

○ - (UC) UNCONFINED COMPRESSION TEST
■ - (Q) UNCONSOLIDATED - UNDRAINED SHEAR TEST
▲ - (R) CONSOLIDATED - UNDRAINED SHEAR TEST
□ - (S) CONSOLIDATED - DRAINED SHEAR TEST

BORINGS WERE TAKEN WITH A 5 INCH DIAMETER STEEL TUBE PISTON TYPE SAMPLER

FOR SOIL BORING LEGEND SEE PLATE A

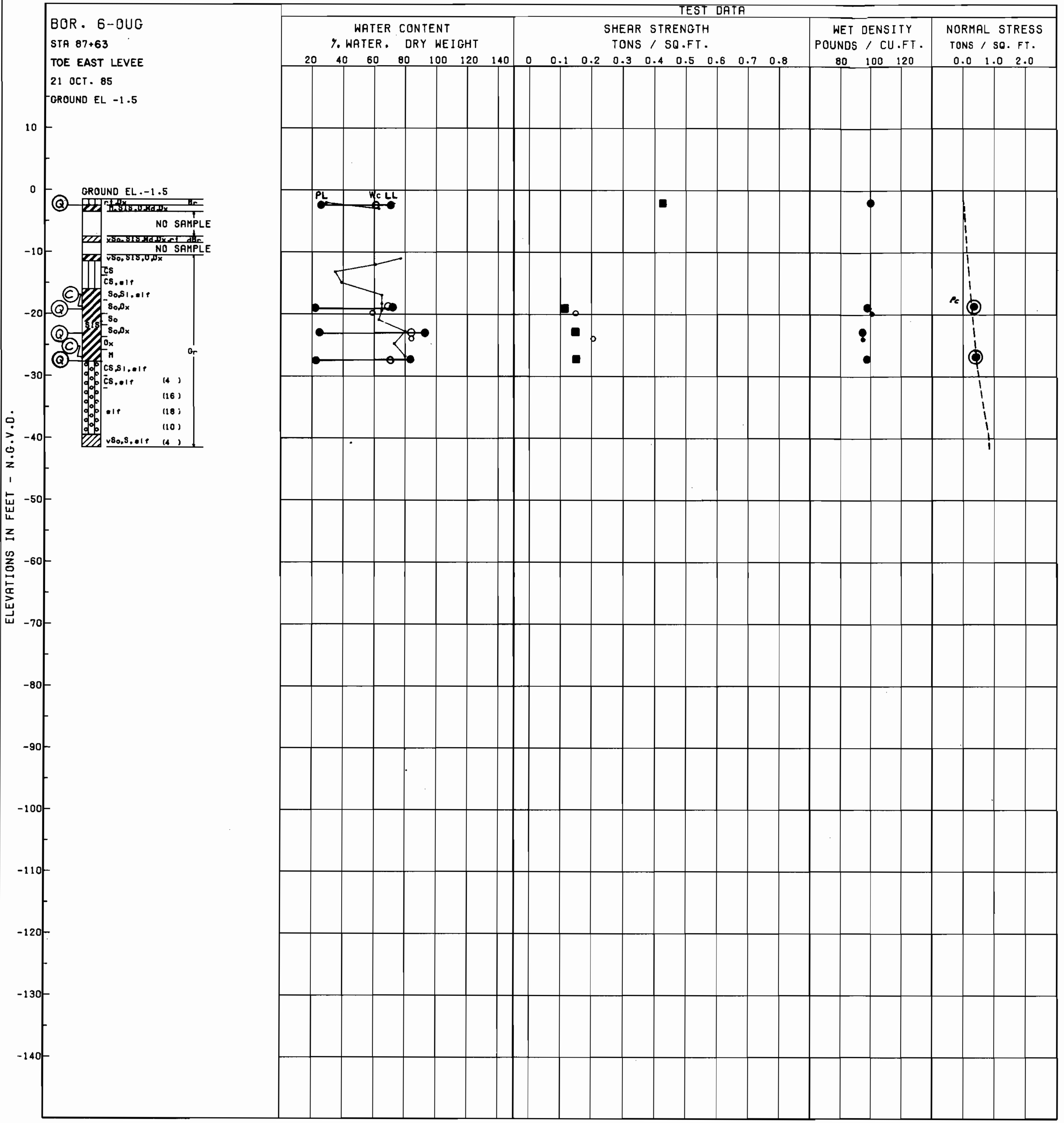
FOR LOCATION OF BORING SEE PLATE 12A

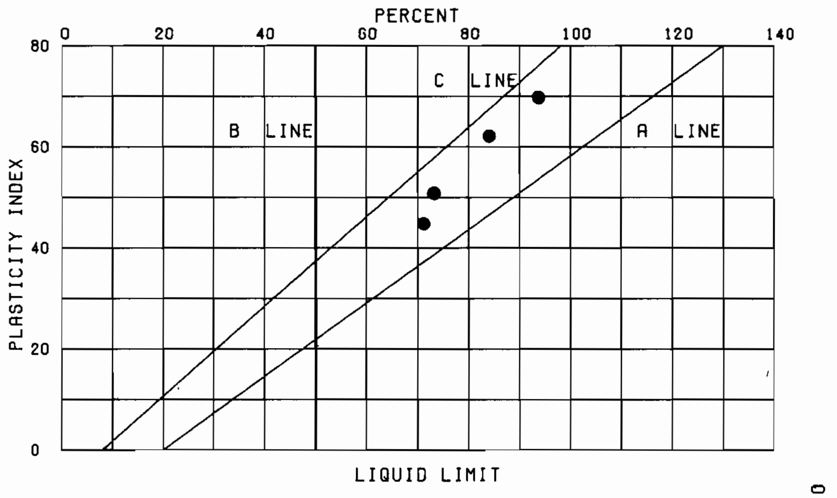
LAKE PONTCHARTRAIN, LA. AND VICINITY
HIGH LEVEL PLAN
DESIGN MEMORANDUM NO. 19 GENERAL DESIGN
ORLEANS AVENUE OUTFALL CANAL

UNDISTURBED BORING NO. 5-OUG

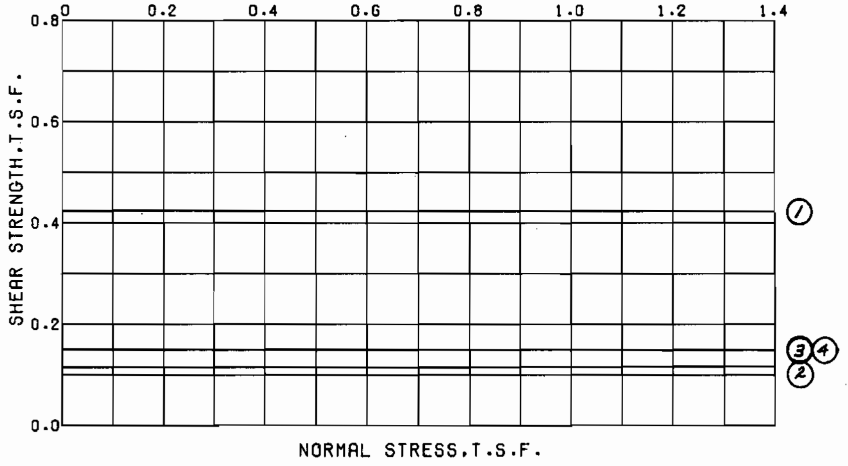
U.S. ARMY ENGINEER DISTRICT, NEW ORLEANS
CORPS OF ENGINEERS

JUNE 1988 FILE NO. H-2-30290



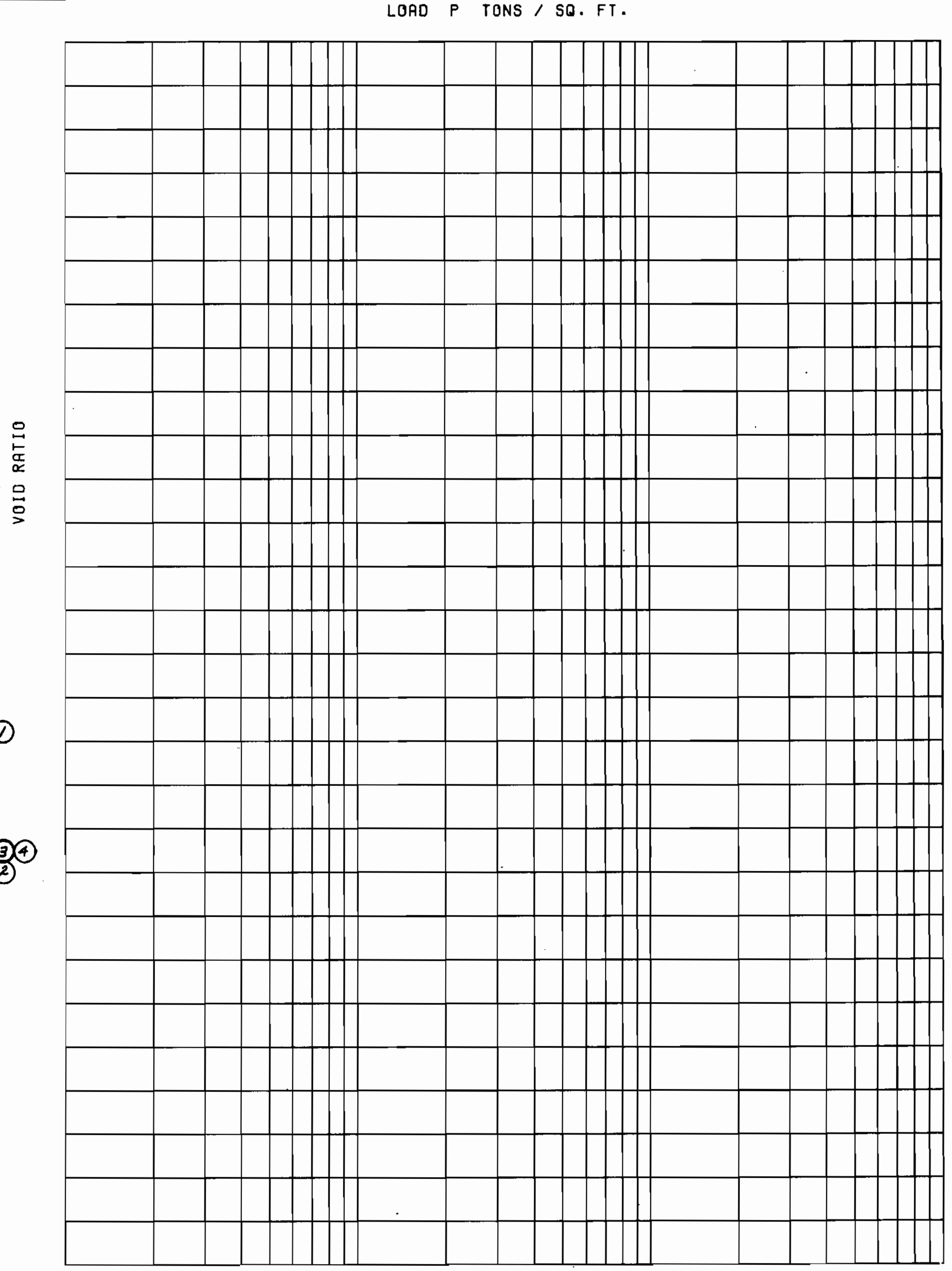


PLASTICITY CHART



SHEAR STRENGTH DATA

ENVELOPE NO.	EL.	TYPE	STRENGTH Φ	C - TSF	CLASS
1.	-2.5	Q	0	0.425	CH
2.	-19.1	Q	0	0.115	CH
3.	-23.0	Q	0	0.150	CH
4	-27.2	Q	0	0.150	CH



CONSOLIDATION DATA

○ - (UC) UNCONFINED COMPRESSION TEST
■ - (Q) UNCONSOLIDATED - UNDRAINED SHEAR TEST
▲ - (R) CONSOLIDATED - UNDRAINED SHEAR TEST
□ - (S) CONSOLIDATED - DRAINED SHEAR TEST

BORINGS WERE TAKEN WITH A 5 INCH DIAMETER STEEL TUBE PISTON TYPE SAMPLER

FOR SOIL BORING LEGEND SEE PLATE A

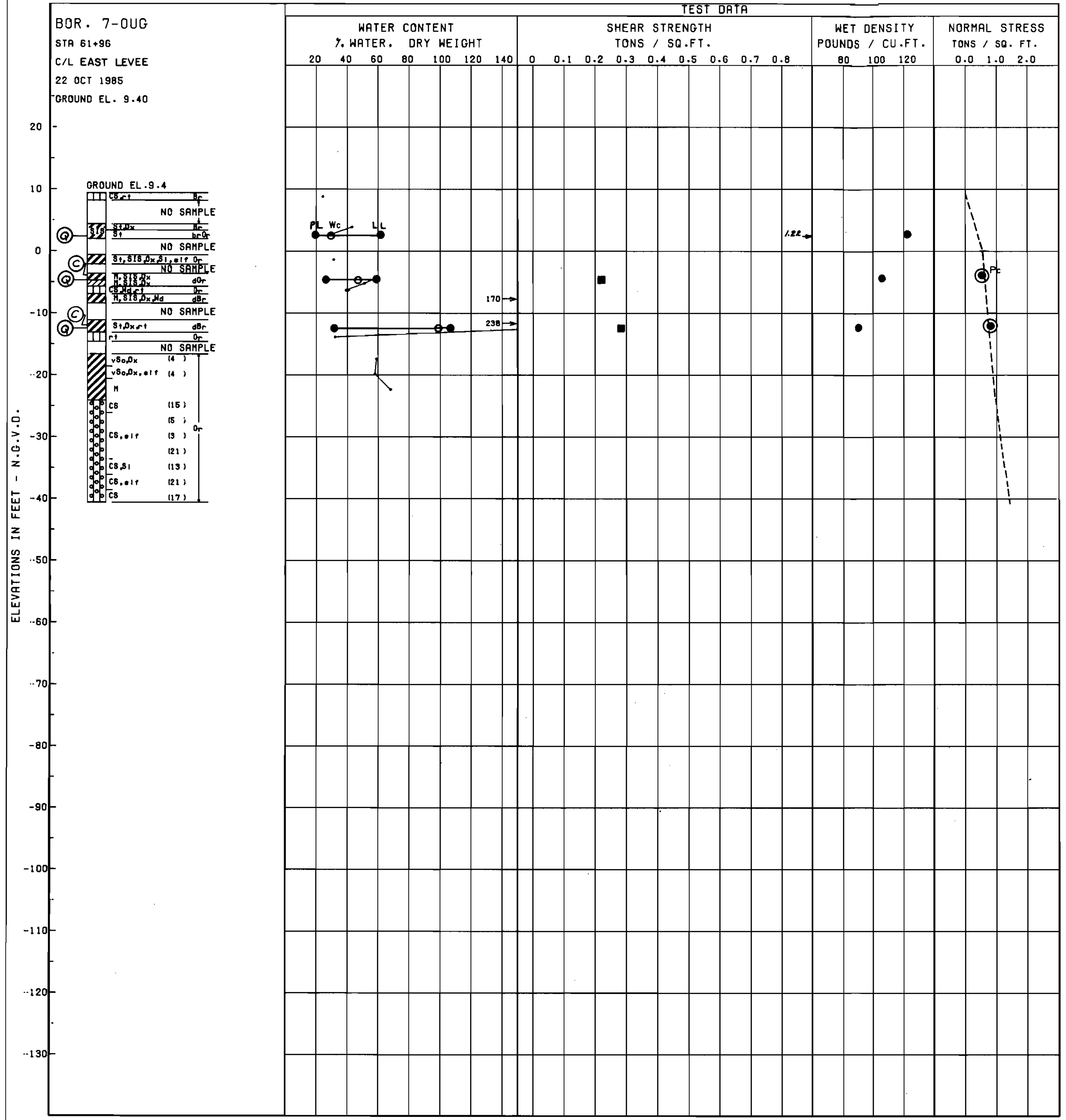
FOR LOCATION OF BORING SEE PLATE 12A

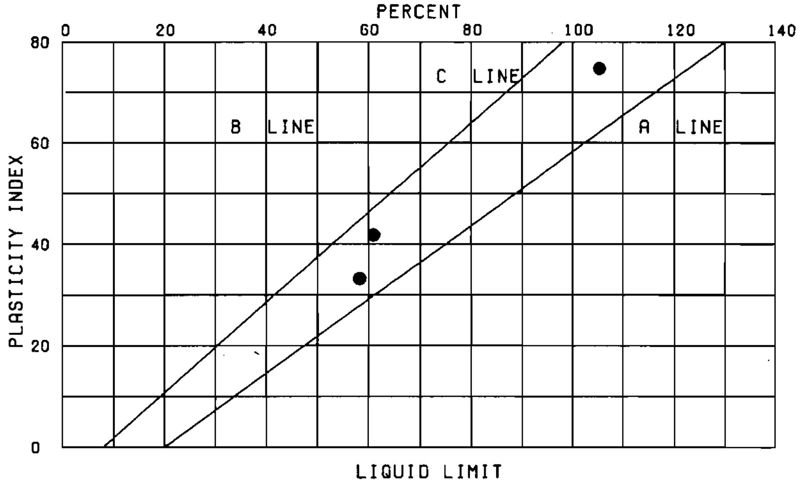
LAKE PONTCHARTRAIN, LA. AND VICINITY
HIGH LEVEL PLAN
DESIGN MEMORANDUM NO. 19 GENERAL DESIGN
ORLEANS AVENUE OUTFALL CANAL

UNDISTURBED BORING NO.6-OUG

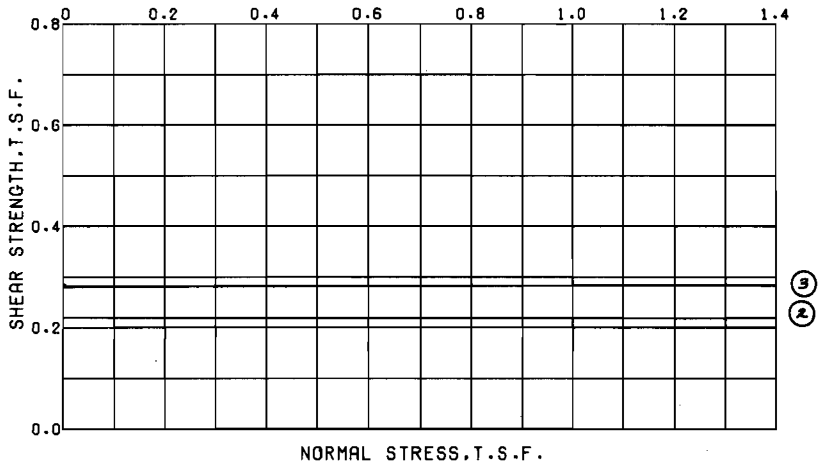
U.S. ARMY ENGINEER DISTRICT, NEW ORLEANS
CORPS OF ENGINEERS

JUNE 1988 FILE NO. H-2-30290





PLASTICITY CHART



SHEAR STRENGTH DATA

ENVELOPE NO.	ENVELOPE EL.	TYPE	STRENGTH Φ	STRENGTH C - TSF	CLASS
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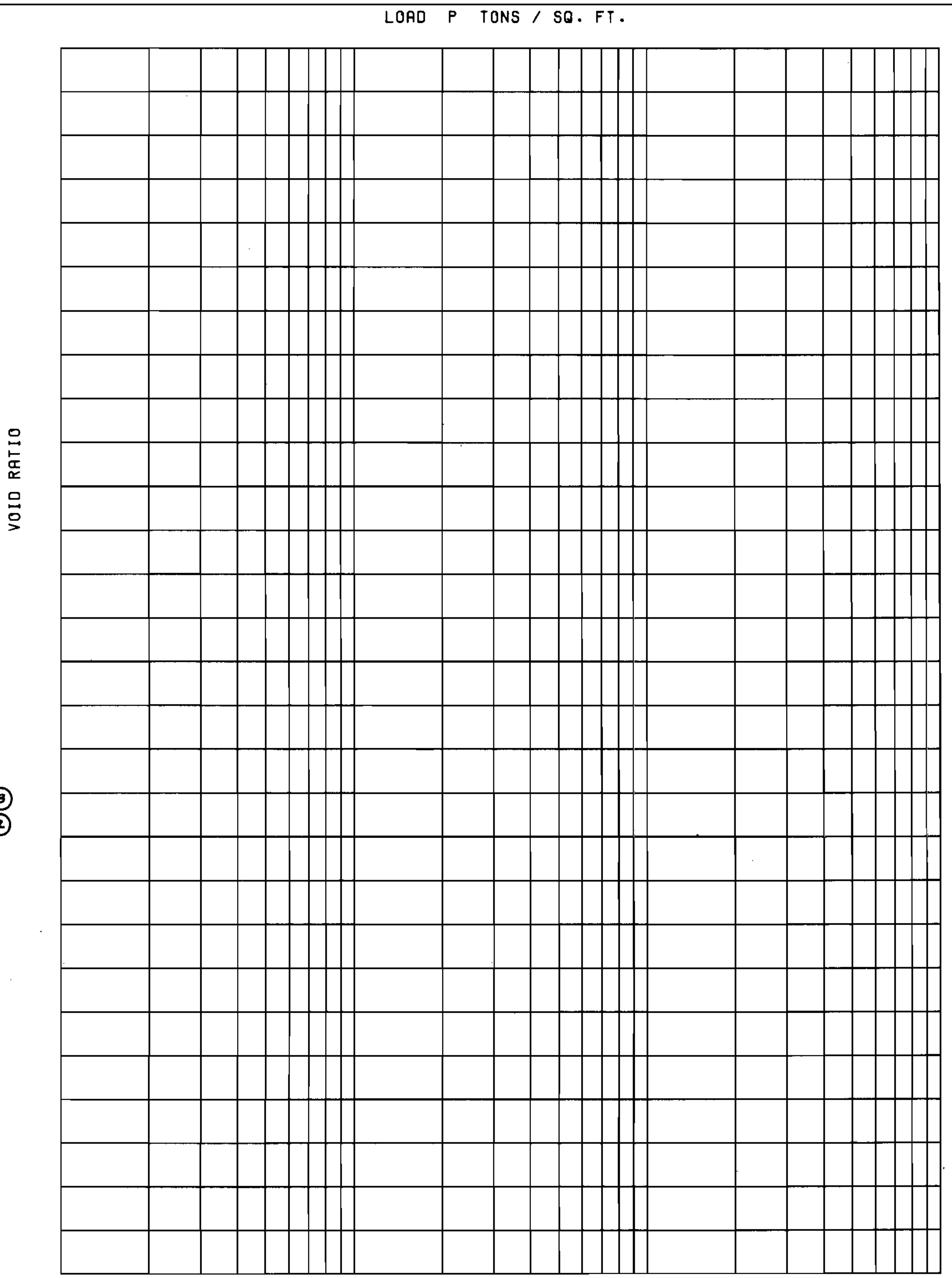
2.	-4.2	Q	O	0.220	CH
3.	-12.3	Q	O	0.285	CH



CONSOLIDATION DATA

○ - (UC) UNCONFINED COMPRESSION TEST
■ - (Q) UNCONSOLIDATED - UNDRAINED SHEAR TEST
▲ - (R) CONSOLIDATED - UNDRAINED SHEAR TEST
□ - (S) CONSOLIDATED - DRAINED SHEAR TEST

BORINGS WERE TAKEN WITH A 5 INCH DIAMETER STEEL TUBE PISTON TYPE SAMPLER

FOR SOIL BORING LEGEND SEE PLATE A

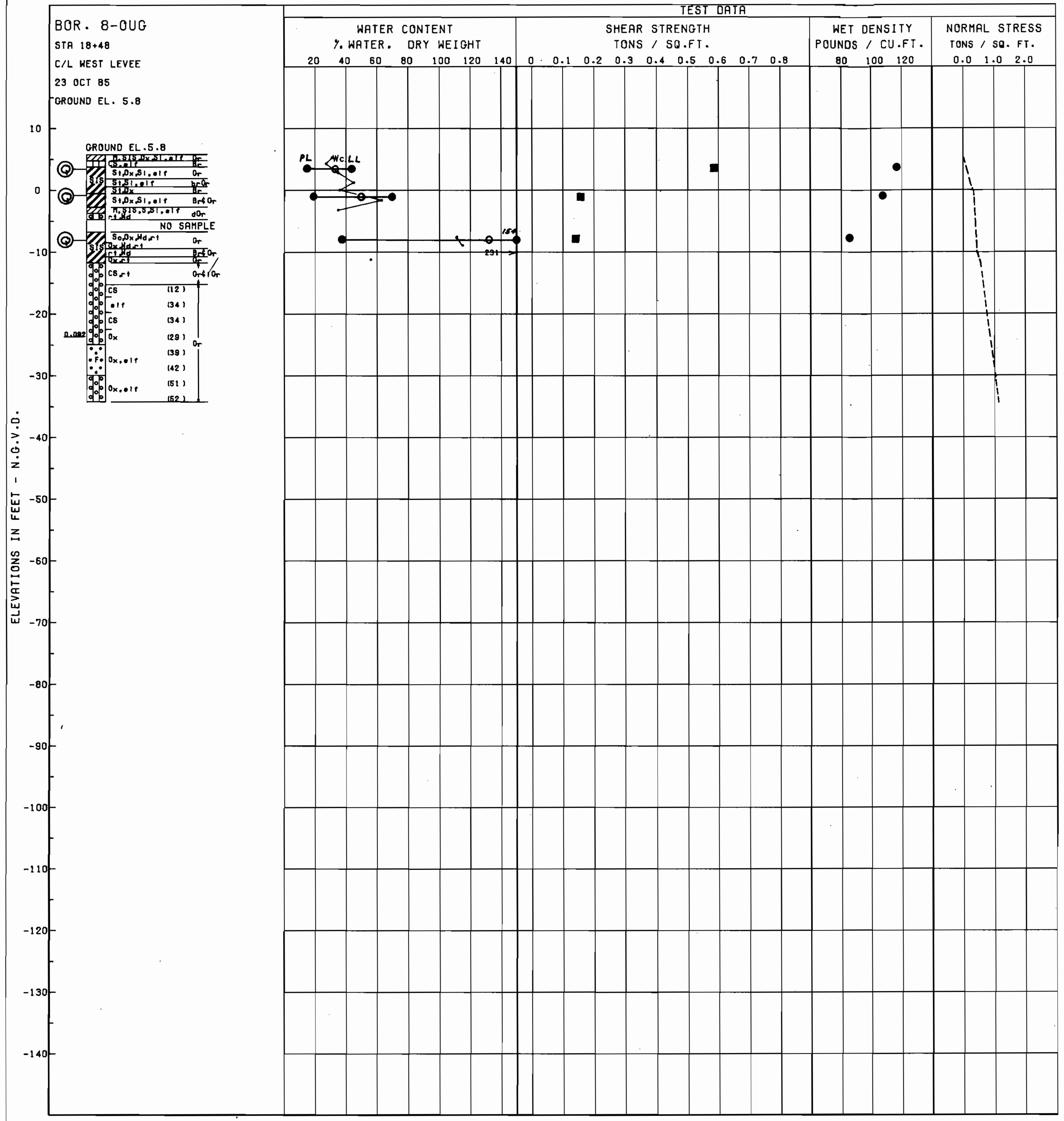
FOR LOCATION OF BORING SEE PLATE 12A

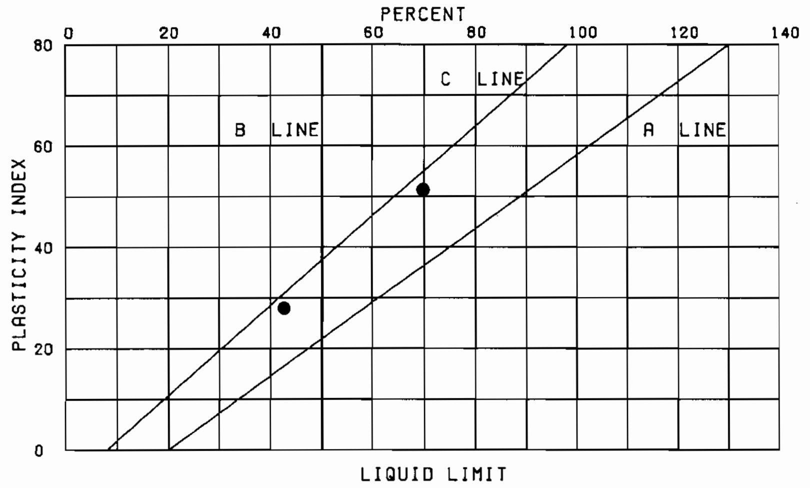
LAKE PONTCHARTRAIN, LA. AND VICINITY
HIGH LEVEL PLAN
DESIGN MEMORANDUM NO. 19 GENERAL DESIGN
ORLEANS AVENUE OUTFALL CANAL

UNDISTURBED BORING NO.7-OUG

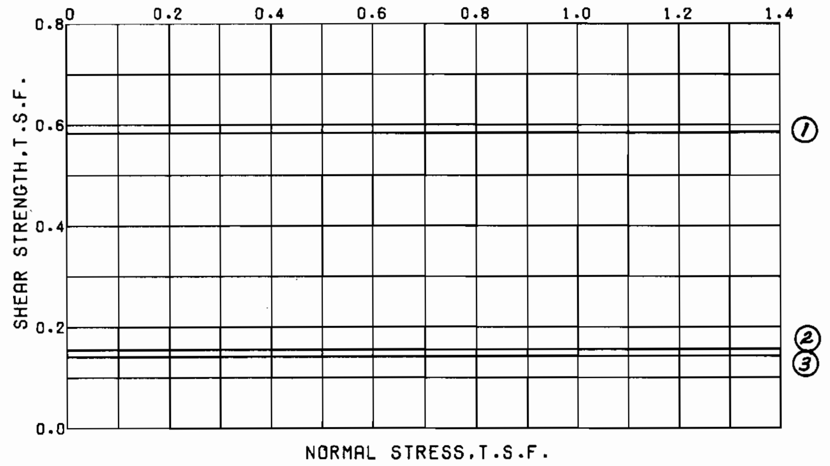
U.S. ARMY ENGINEER DISTRICT, NEW ORLEANS
CORPS OF ENGINEERS

JUNE 1988 FILE NO. H-2-30290





PLASTICITY CHART



SHEAR STRENGTH DATA

ENVELOPE		TYPE	STRENGTH		CLASS
NO.	EL.		Φ	C - TSF	
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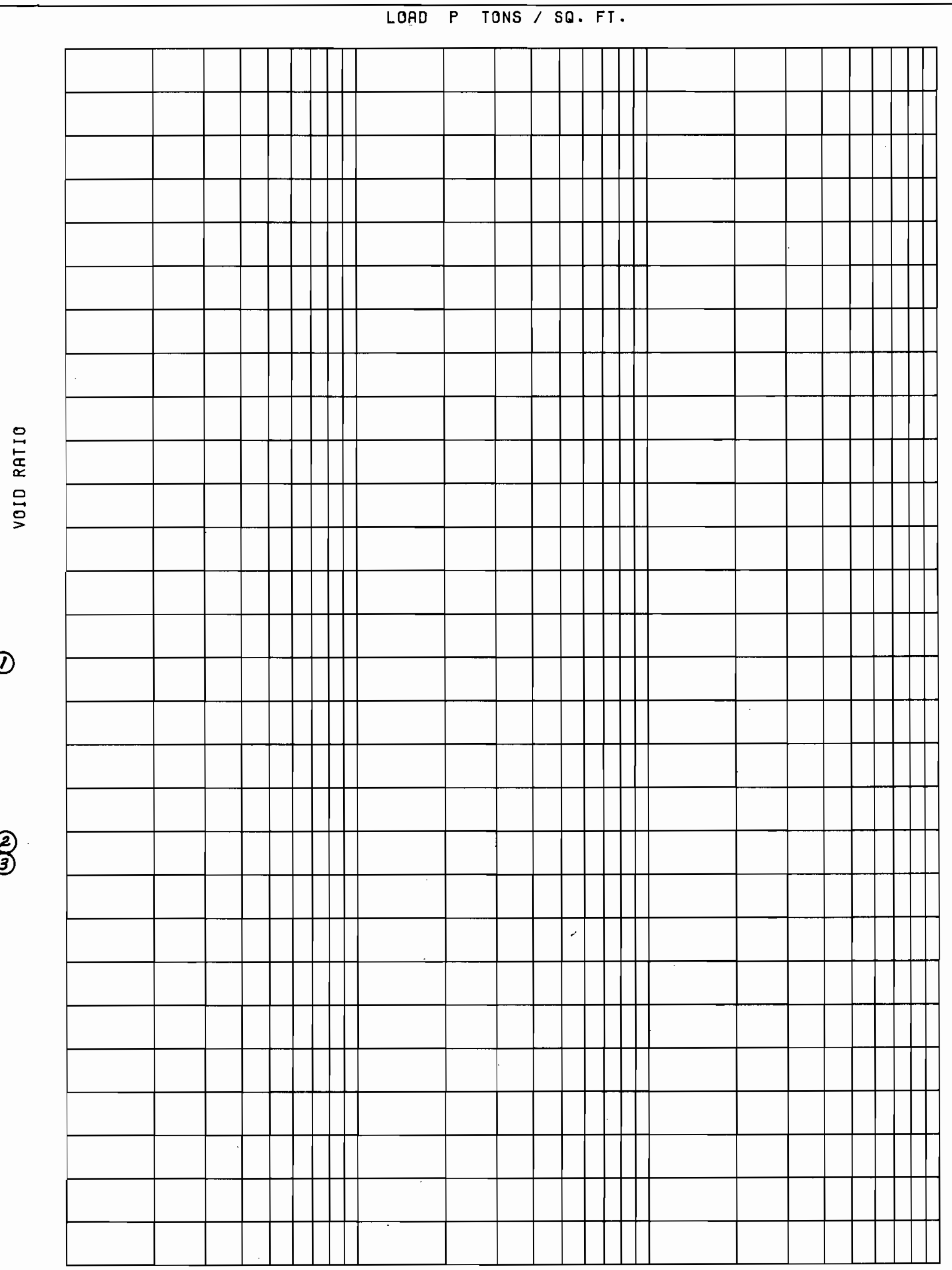
2.	-0.8	Q	0	0 155	CH
3.	-8.0	Q	0	0.140	CH



CONSOLIDATION DATA

- ○ - (UC) UNCONFINED COMPRESSION TEST
- ■ - (Q) UNCONSOLIDATED - UNDRAINED SHEAR TEST
- ▲ - (R) CONSOLIDATED - UNDRAINED SHEAR TEST
- □ - (S) CONSOLIDATED - DRAINED SHEAR TEST

BORINGS WERE TAKEN WITH A 5 INCH DIAMETER STEEL TUBE PISTON TYPE SAMPLER

FOR SOIL BORING LEGEND SEE PLATE A

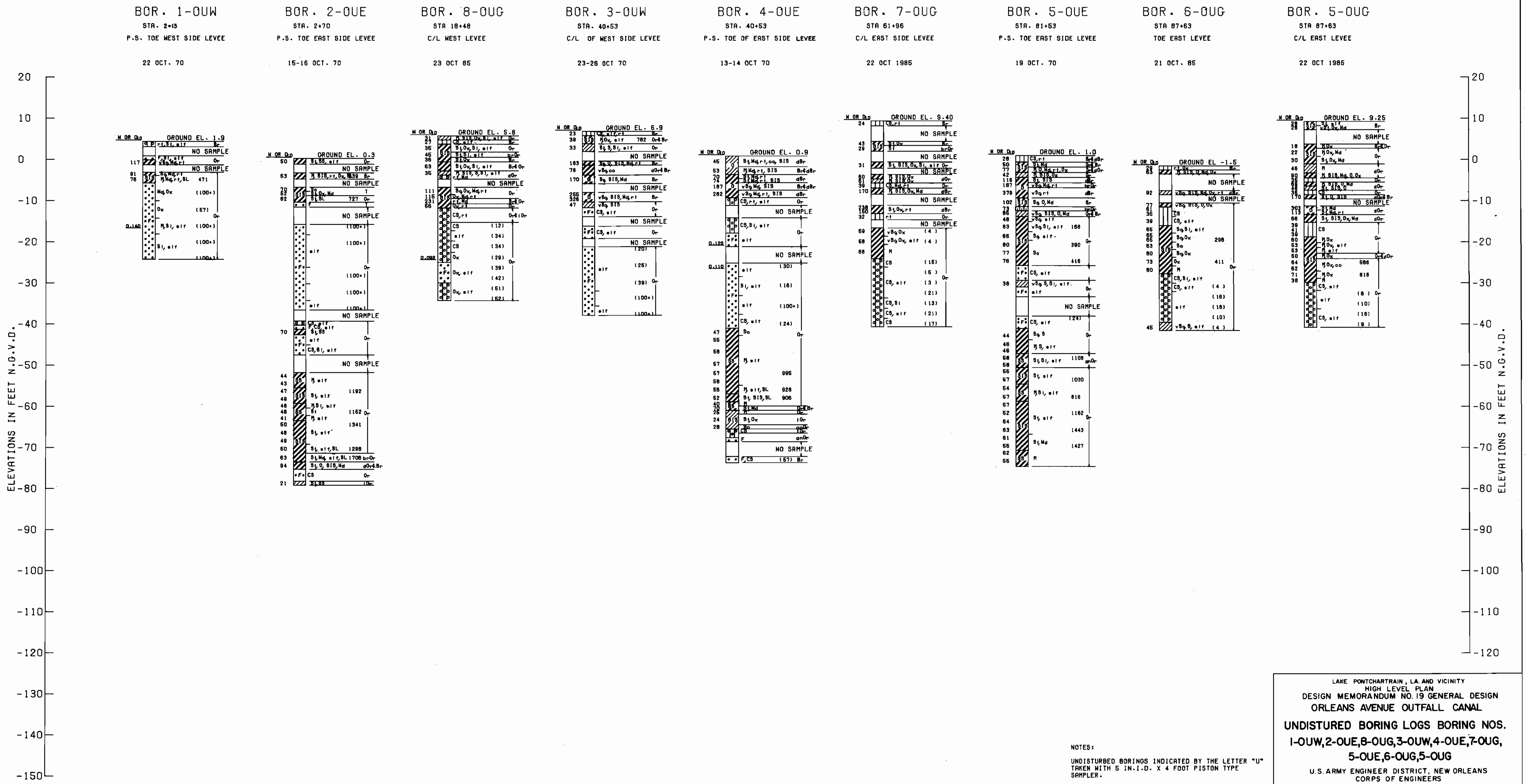
FOR LOCATION OF BORING SEE PLATE 12A

LAKE PONTCHARTRAIN, LA. AND VICINITY
HIGH LEVEL PLAN
DESIGN MEMORANDUM NO. 19 GENERAL DESIGN
ORLEANS AVENUE OUTFALL CANAL

UNDISTURBED BORING NO.8-OUG

U.S. ARMY ENGINEER DISTRICT, NEW ORLEANS
CORPS OF ENGINEERS

JUNE 1988 FILE NO. H-2-30290



NOTES:

UNDISTURBED BORINGS INDICATED BY THE LETTER "U" TAKEN WITH 5 IN.I.D. X 4 FOOT PISTON TYPE SAMPLER.

FOR BORING LOCATIONS SEE PLATE 12A

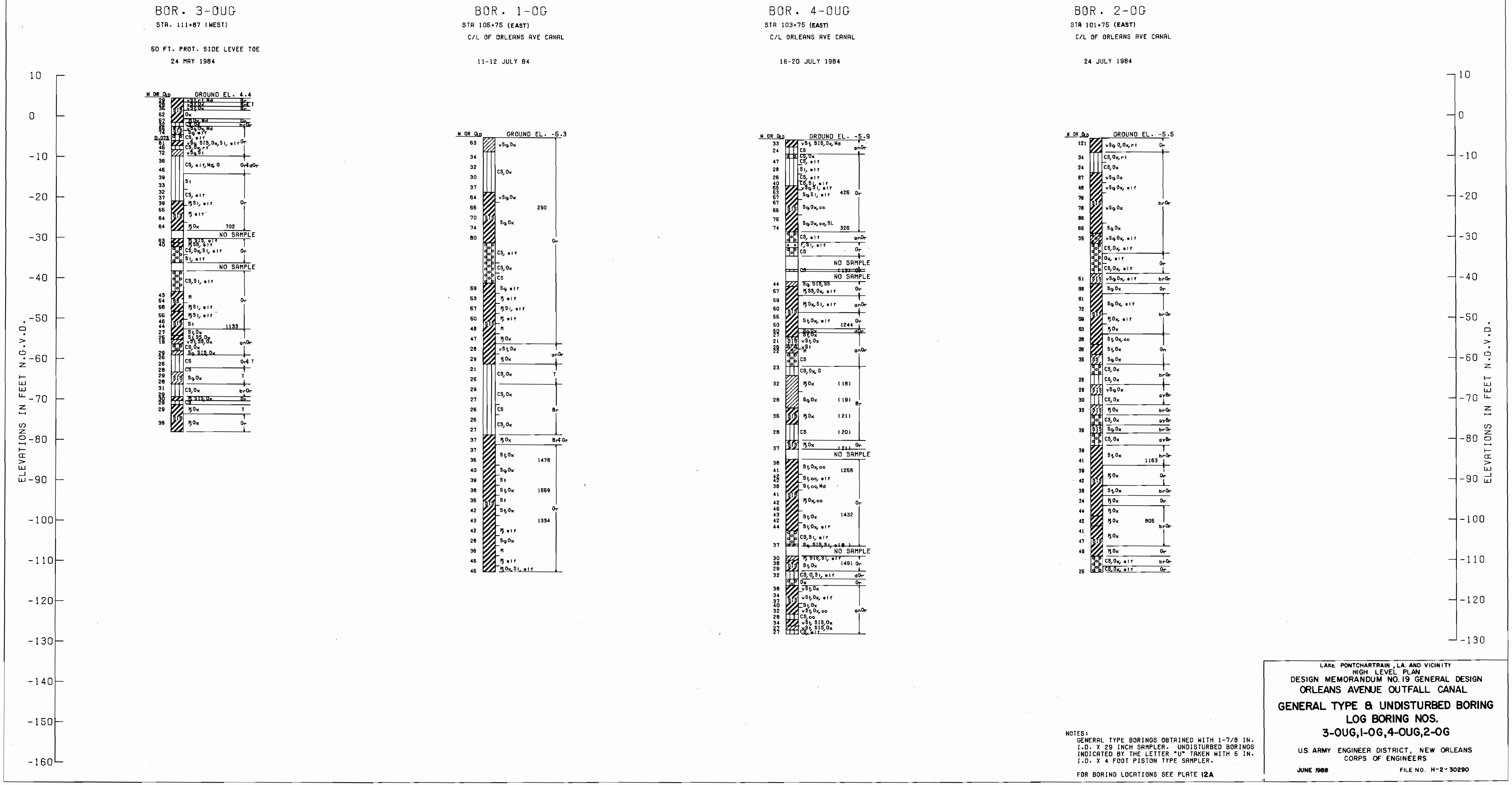
LAKE PONTCHARTRAIN, LA. AND VICINITY
HIGH LEVEL PLAN
DESIGN MEMORANDUM NO. 19 GENERAL DESIGN
ORLEANS AVENUE OUTFALL CANAL

UNDISTURED BORING LOGS BORING NOS. 1-OUW,2-OUE,8-OUG,3-OUW,4-OUE,7-OUG, 5-OUE,6-OUG,5-OUG

U.S. ARMY ENGINEER DISTRICT, NEW ORLEANS
CORPS OF ENGINEERS

JUNE 1988 FILE NO. H-2-30290

PLATE 36



NOTES:
GENERAL TYPE BORINGS OBTAINED WITH 1-7/8 IN. I.D. X 29 INCH SAMPLER. UNDISTURBED BORINGS INDICATED BY THE LETTER "U" TAKEN WITH 5 IN. I.D. X 4 FOOT PISTON TYPE SAMPLER.

FOR BORING LOCATIONS SEE PLATE 12A

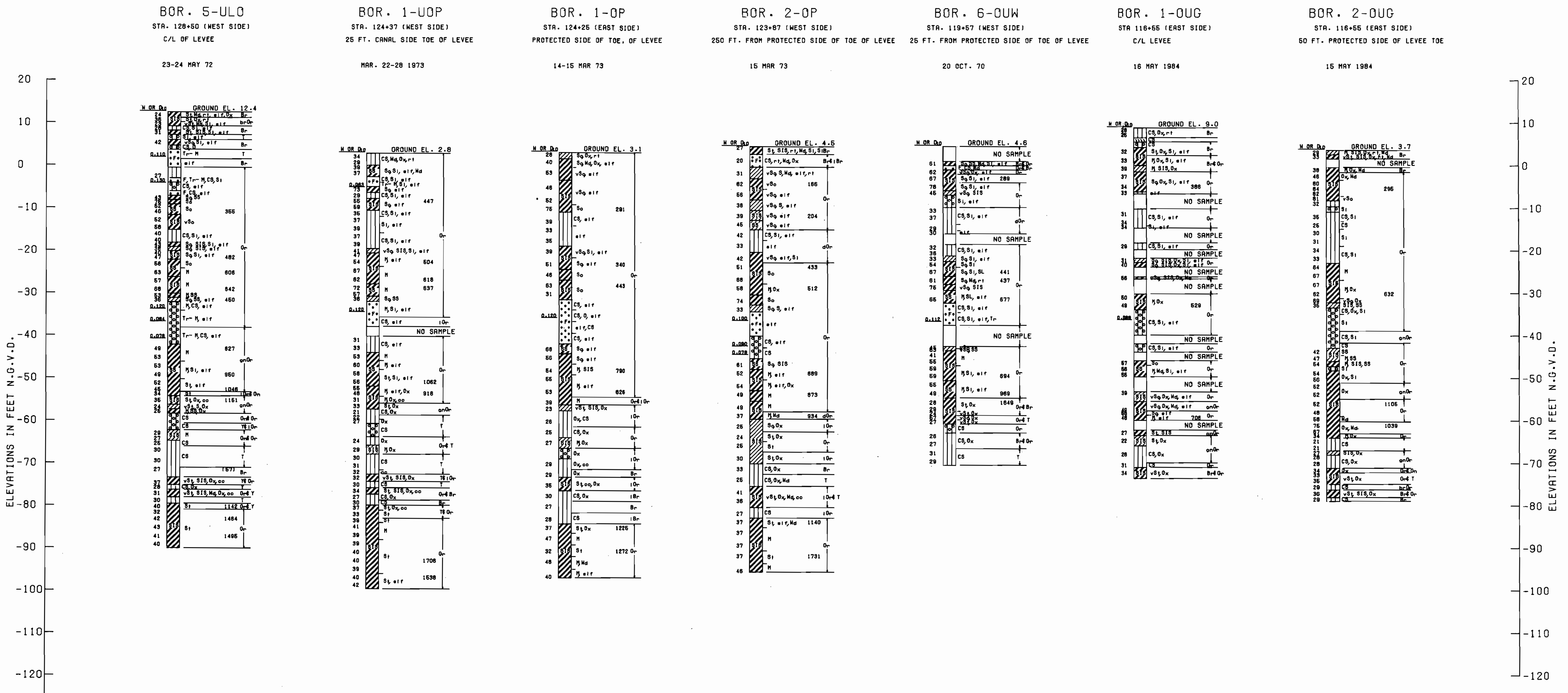
LAKE PONTCHARTRAIN, LA. AND VICINITY
HIGH LEVEL PLAN
DESIGN MEMORANDUM NO. 19 GENERAL DESIGN
ORLEANS AVENUE OUTFALL CANAL

GENERAL TYPE & UNDISTURBED BORING LOG BORING NOS. 3-OUG,1-OG,4-OUG,2-OG

U.S. ARMY ENGINEER DISTRICT, NEW ORLEANS
CORPS OF ENGINEERS

JUNE 1988 FILE NO. H-2-30290

PLATE 37



NOTES:
GENERAL TYPE BORINGS OBTAINED WITH 1-7/8 IN. I.D. X 29 INCH SAMPLER. UNDISTURBED BORINGS INDICATED BY THE LETTER "U" TAKEN WITH 5 IN. I.D. X 4 FOOT PISTON TYPE SAMPLER.

FOR BORING LOCATIONS SEE PLATE 12A

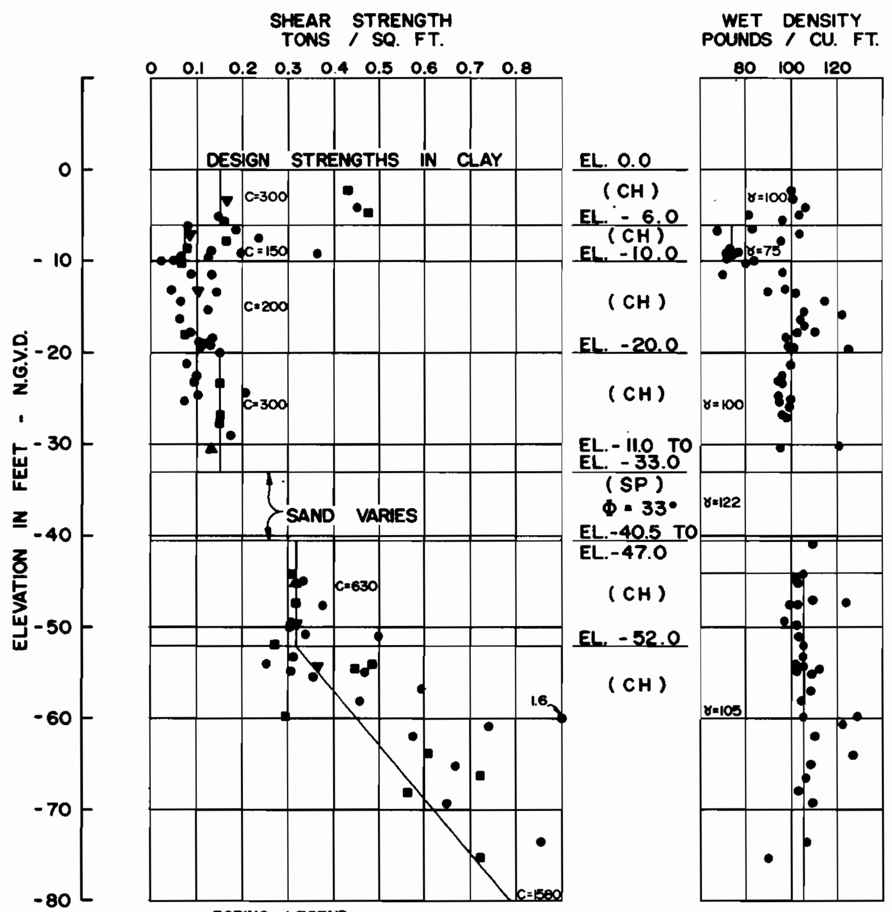
LAKE PONTCHARTRAIN, LA. AND VICINITY
HIGH LEVEL PLAN
DESIGN MEMORANDUM NO. 19 GENERAL DESIGN
ORLEANS AVENUE OUTFALL CANAL

GENERAL TYPE & UNDISTURBED BORING LOG BORING NOS. 5-ULO, 1-UOP, 1-OP, 2-OP, 6-OUW, 1-OUG, 2-OUG

U.S. ARMY ENGINEER DISTRICT, NEW ORLEANS
CORPS OF ENGINEERS

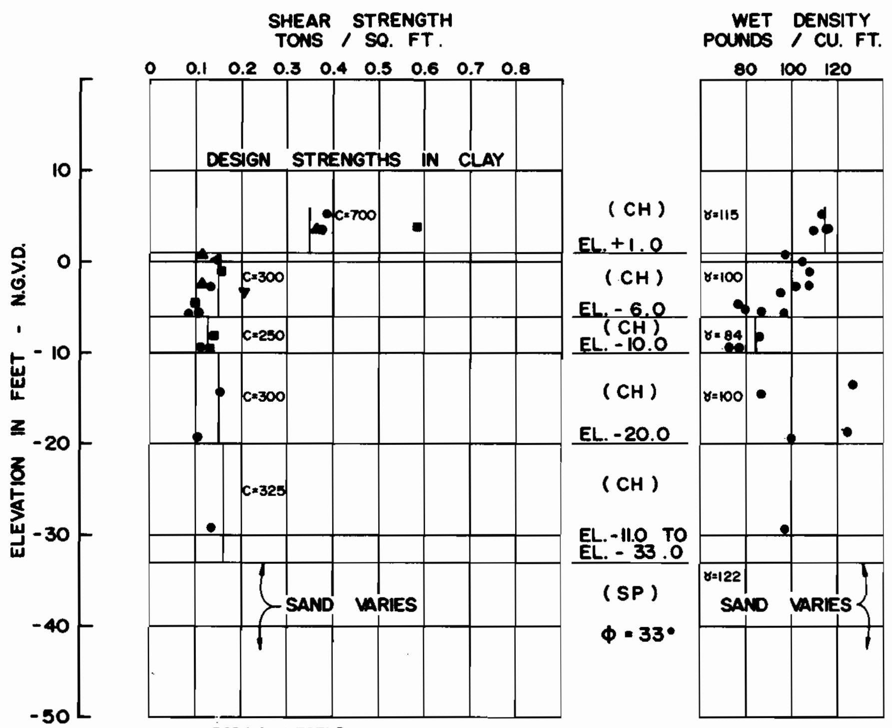
JUNE 1988 FILE NO. H-2-30290

STA. 0+00 TO STA. 90+50 EAST AND WEST SIDE TOE



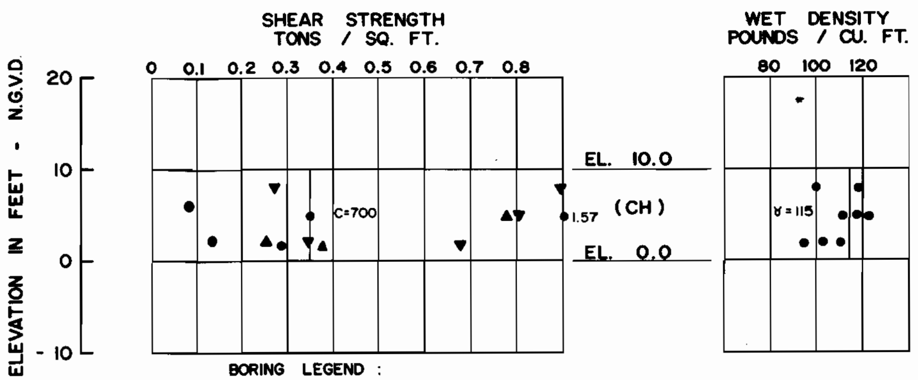
BORING LEGEND :
SHEAR STRENGTHS
●■ 1-OUW , 2-OUE , 4-OUE , 5-OUE , 6-OUG PLATES 20,21,23,24,33
●◄▲▼ 4 , 8 , 14 , 16 , 18 , 20 , 22 , 24 , 26 , 28 , 30 , 32 , 36 APPENDIX A

STA. 0+00 TO STA. 90+50 ℄ WEST LEVEE



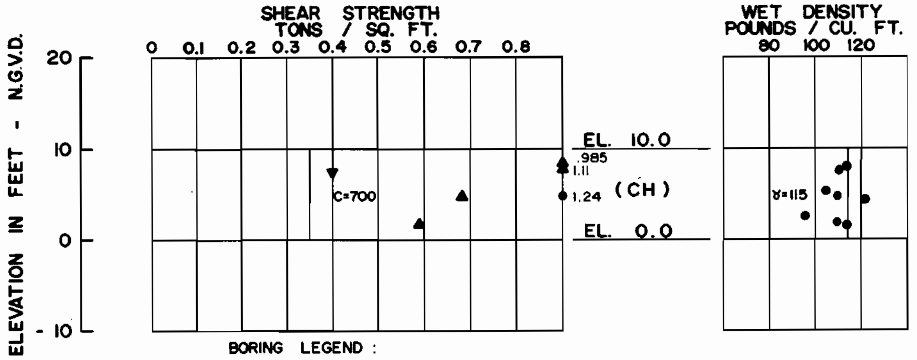
BORING LEGEND :
SHEAR STRENGTHS
●■ 8-OUG , 3-OUW PLATES 35,22
●◄▲▼ 6 , 10 , 34 APPENDIX A

STA. 0+00 TO STA. 36+50 ℄ EAST LEVEE



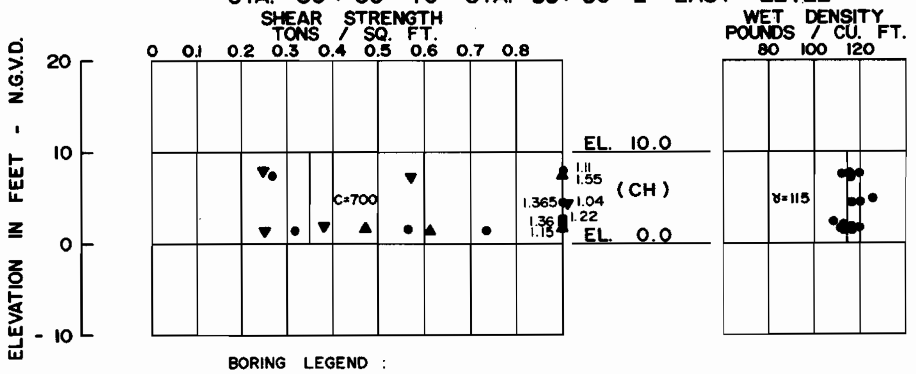
BORING LEGEND :
SHEAR STRENGTHS
●▲▼ 3 , 5 , 7 , 9 , 11 , 13 , APPENDIX A .

STA. 36+50 TO STA. 50+00 ℄ EAST LEVEE



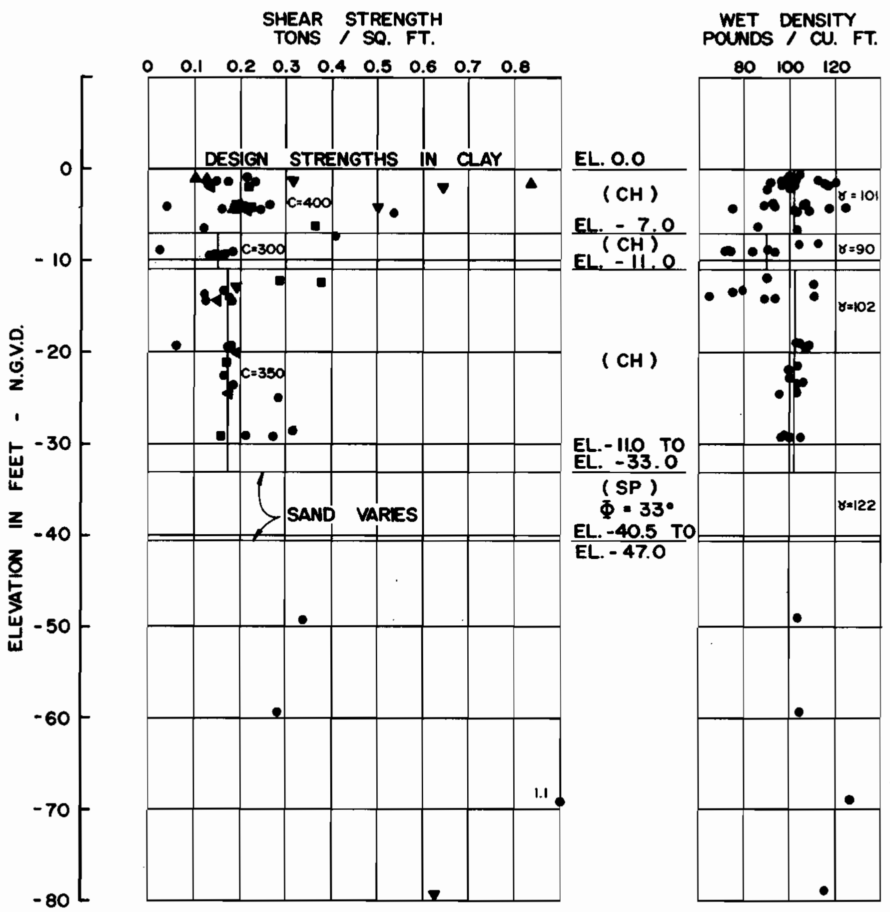
BORING LEGEND :
SHEAR STRENGTHS
●▲▼ 15 , 17 , 19 APPENDIX A

STA. 50+00 TO STA. 90+50 ℄ EAST LEVEE

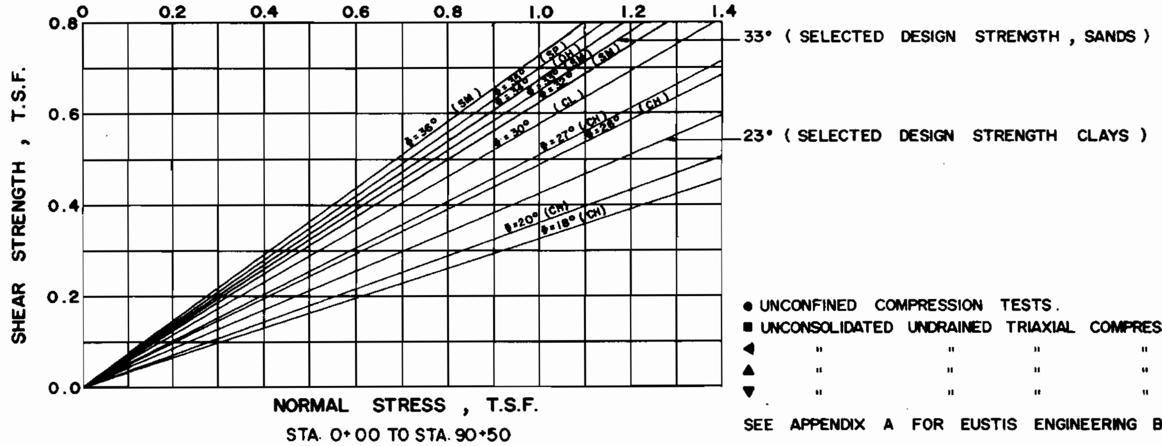


BORING LEGEND :
SHEAR STRENGTHS
●■ 5-OUG PLATE 32
●■ 7-OUG PLATE 34
●▲▼ 21 , 23 , 25 , 27 , 29 , 31 , 33 , 35 APPENDIX A

STA. 0+00 TO STA. 90+50 ℄ EAST LEVEE



BORING LEGEND :
SHEAR STRENGTHS
●■ 5-OUG
●■ 7-OUG
●◄▲▼ 1 , 3 , 5 , 7 , 9 , 11 , 13 , 15 , 17 , 19 , 21 , 23 , 25 , 27 , 29 , 31 , 33 , 35 APPENDIX A .



STA. 0+00 TO STA. 90+50

(S) SHEAR STRENGTH , T.S.F.

● UNCONFINED COMPRESSION TESTS.
■ UNCONSOLIDATED UNDRAINED TRIAXIAL COMPRESSION TESTS.
◄ " " " " " 3 PT EUSTIS ENGINEERING 5" I.D. BORING
▲ " " " " " 1 PT " " 5" I.D. BORING
▼ " " " " " 1 PT " " 3" I.D. BORING

SEE APPENDIX A FOR EUSTIS ENGINEERING BORINGS AND LABORATORY TESTS.

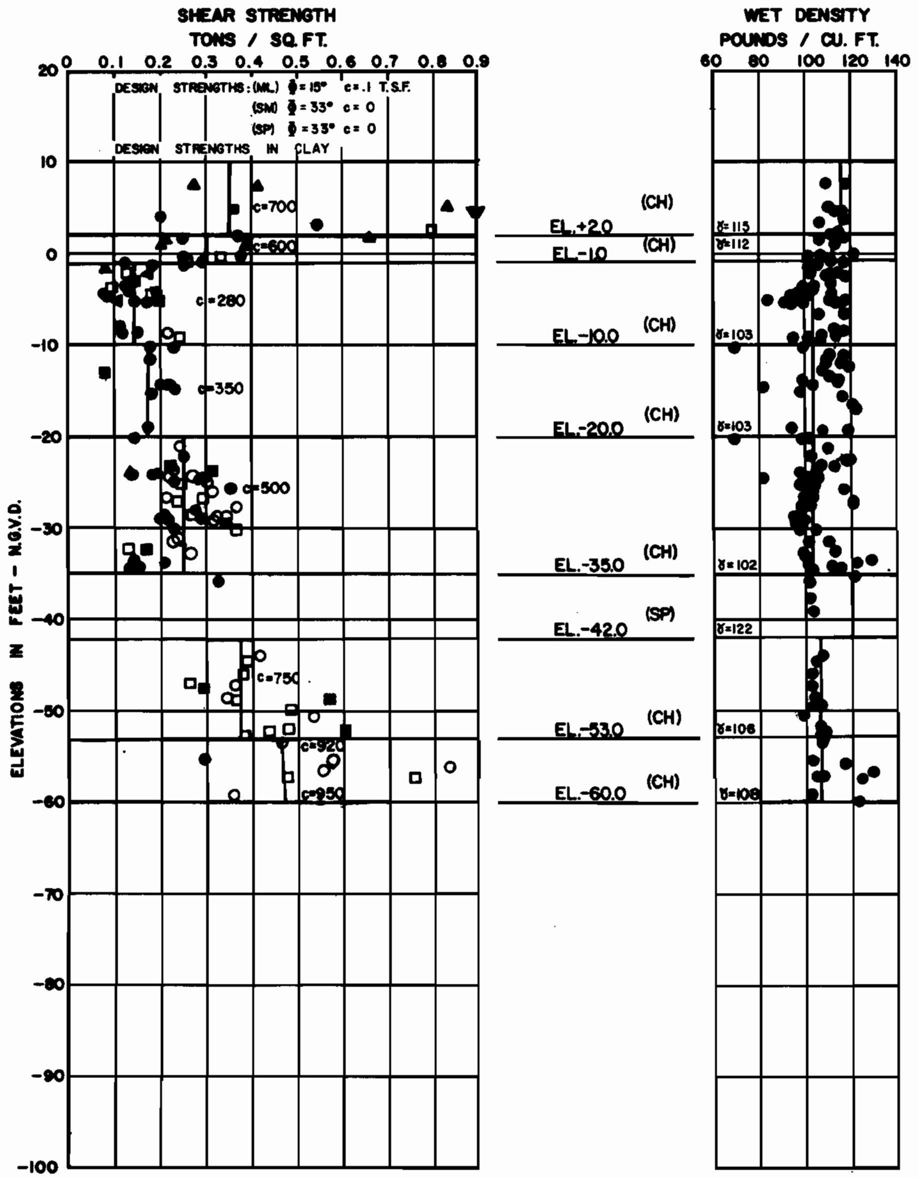
LAKE PONTCHARTRAIN, LA. AND VICINITY
HIGH LEVEL PLAN
DESIGN MEMORANDUM NO. 19 GENERAL DESIGN
ORLEANS AVENUE OUTFALL CANAL

SOIL DESIGN PARAMETERS

U.S. ARMY ENGINEER DISTRICT, NEW ORLEANS
CORPS OF ENGINEERS

JUNE 1988 FILE NO. H-2-30290

STA. 90+50 TO LAKE



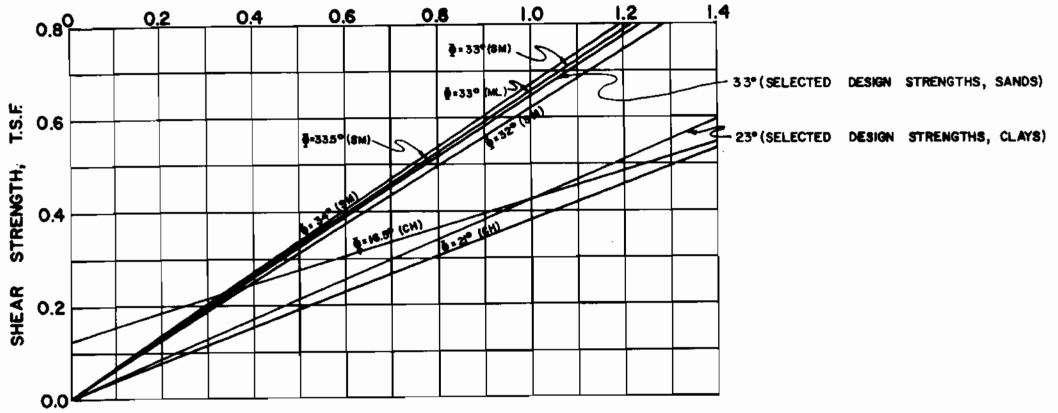
BORING LEGEND:

SHEAR STRENGTHS

- ○ □ 2-OUG, 3-OUG, 6-OUW, 1-UOP TOE, PLATES 29,30,25,27
- ● ■ 5-ULO, 1-OUG C/L, PLATES 26, 28
- ● ▲ ▼ ◀ 37-52 APPENDIX A

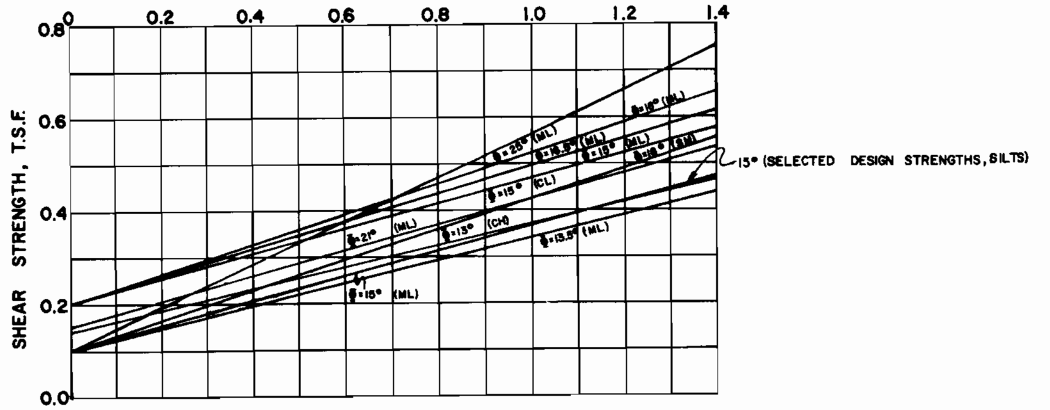
GENERAL TYPE BORINGS ALSO USED FOR STRATIFICATION AND CLASSIFICATION ARE: 1-OP, & 2-OP

STA. 90+50 TO LAKE



(S) SHEAR STRENGTHS, T.S.F.

STA. 90+50 TO LAKE



(R) SHEAR STRENGTHS, T.S.F.

○ ● UNCONFINED COMPRESSION TESTS

□ ■ ▶ ⊙ ▽ ◁ ◇ UNCONSOLIDATED UNDRAINED TRIAXIAL COMPRESSION TESTS

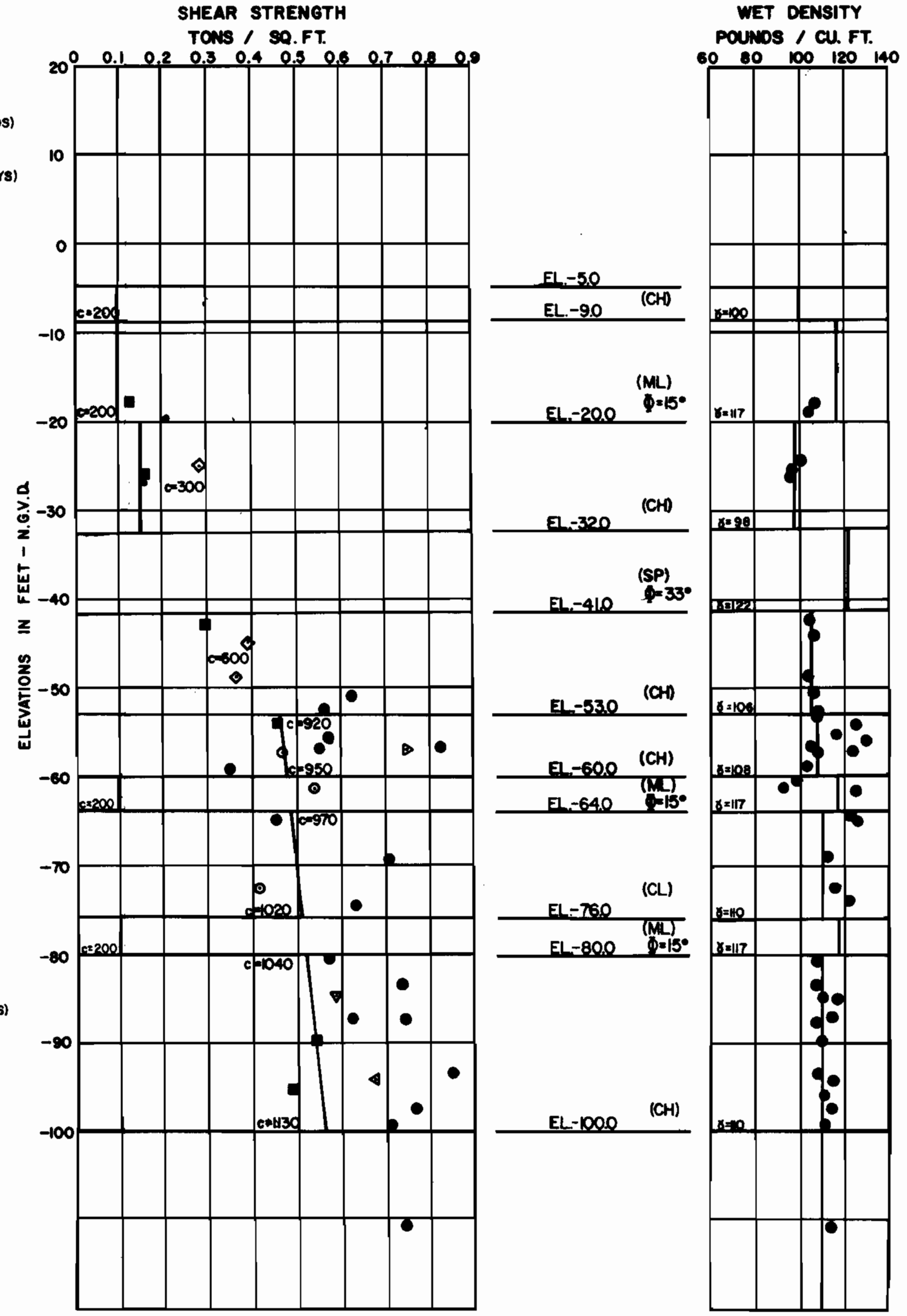
◀ " " " " " 3 PT EUSTIS ENGINEERING 5" I.D. BORING

▲ " " " " " 1 " " " 5" I.D. BORING

▼ " " " " " 1 " " " 3" I.D. BORING

SEE APPENDIX A FOR EUSTIS ENGINEERING BORINGS AND LABORATORY TESTS

C/L CHANNEL AT VALVE STRUCTURE



SHEAR STRENGTHS

- ● ■ 4-OUG PLATE 31
- ● ▶ 6-OUW PLATE 25
- ● ⊙ 2-OUG PLATE 29
- ● ▽ 5-ULO PLATE 26
- ● ◁ 1-UOP PLATE 27
- ● ◇ 3-OUG PLATE 30
- ● 38 APPENDIX A

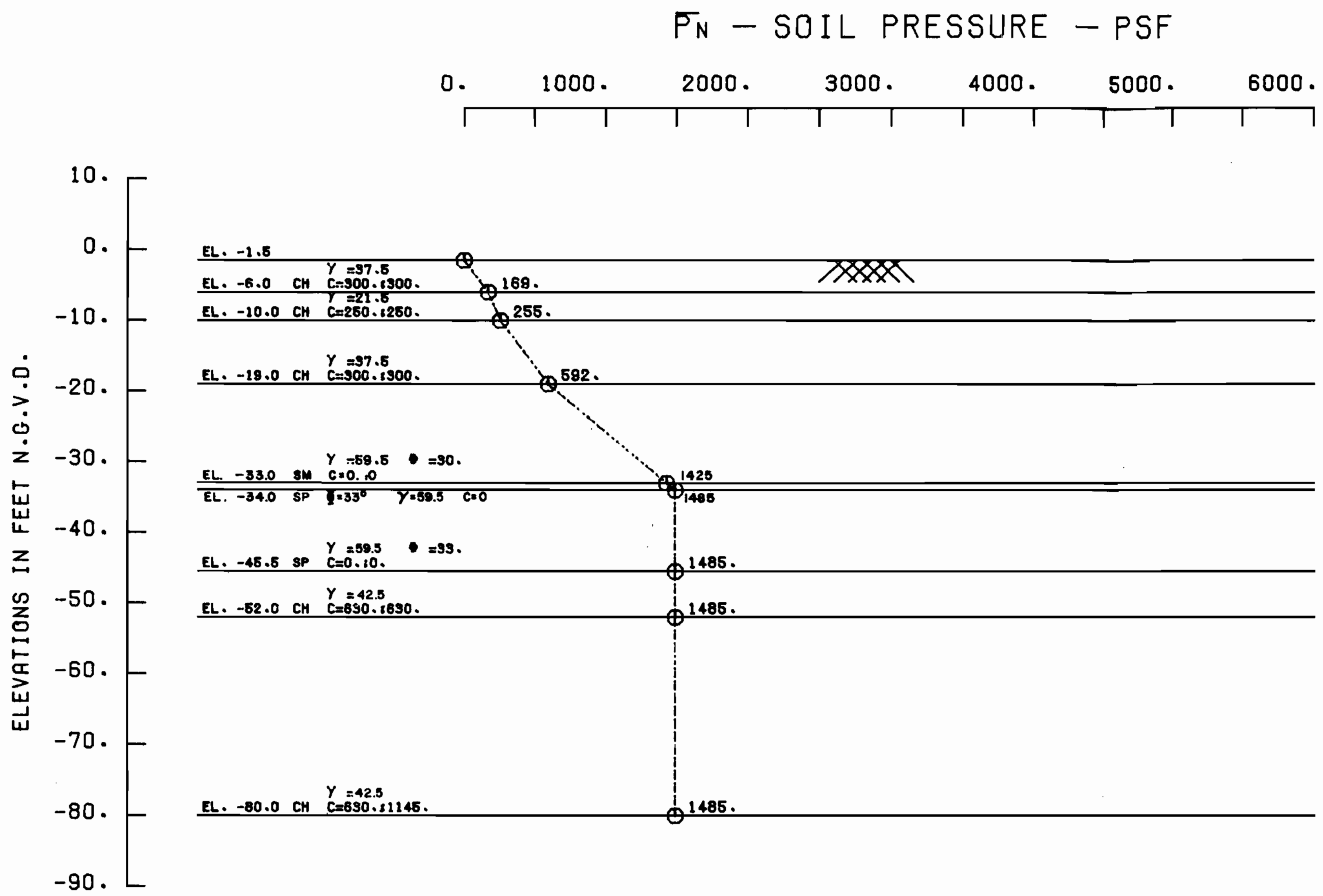
GENERAL TYPE BORINGS ALSO USED FOR STRATIFICATION AND CLASSIFICATION ARE: 1-OG & 2-OG

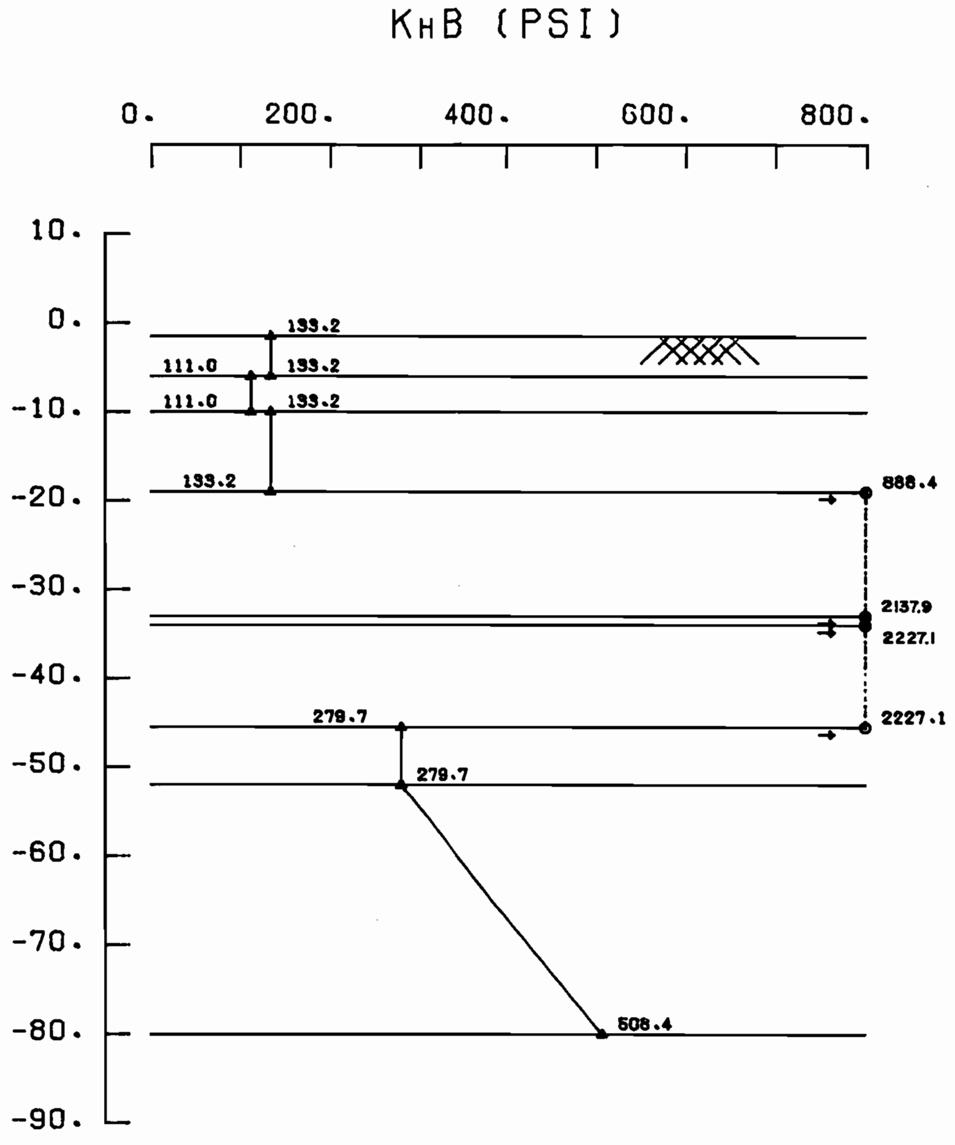
LAKE PONTCHARTRAIN, LA. AND VICINITY
HIGH LEVEL PLAN
DESIGN MEMORANDUM NO. 19 GENERAL DESIGN
ORLEANS AVENUE OUTFALL CANAL

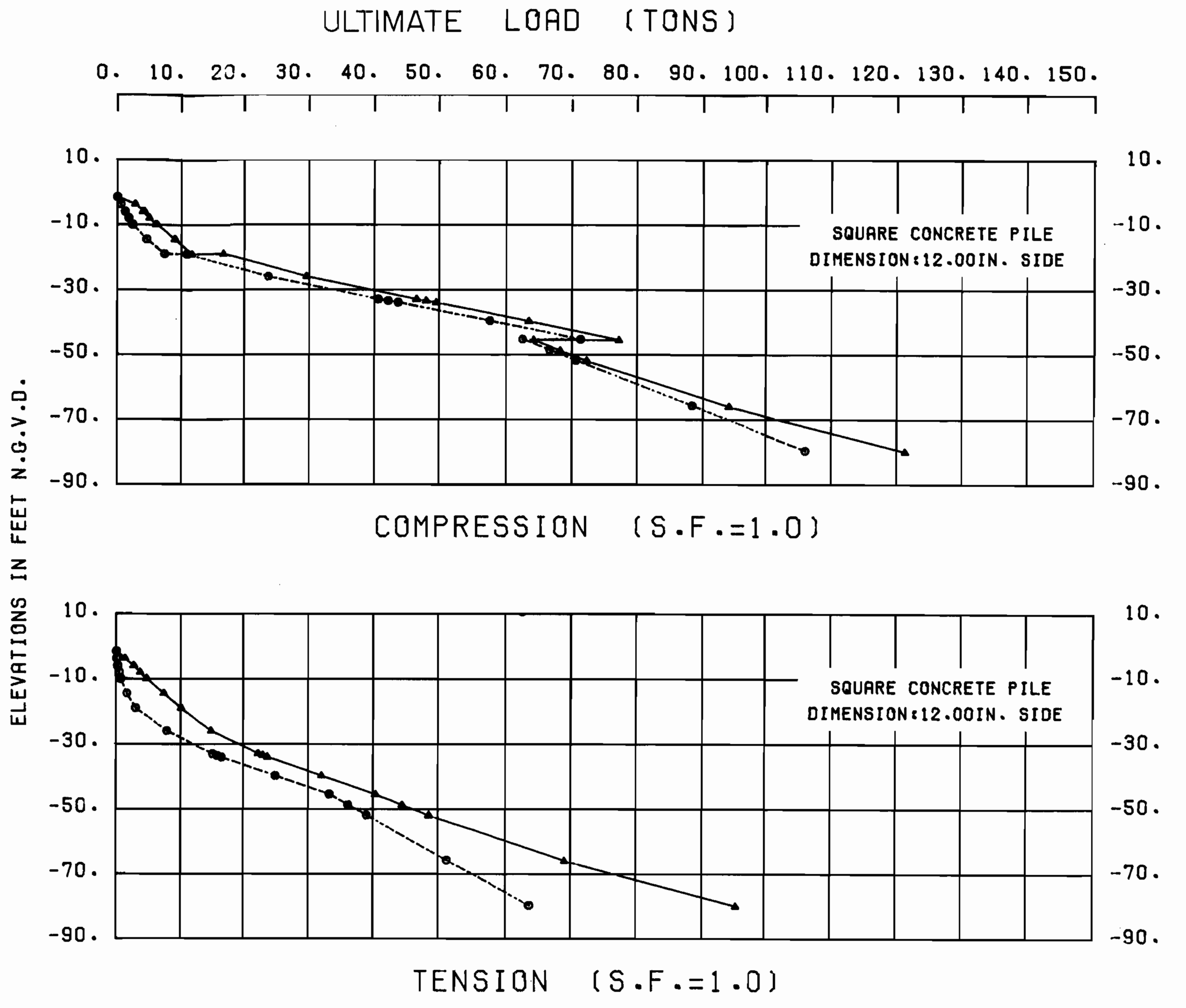
SOIL DESIGN PARAMETERS

U.S. ARMY ENGINEER DISTRICT, NEW ORLEANS
CORPS OF ENGINEERS

JUNE 1988 FILE NO. H-2-30290







S-CASE
CH,CL- $\phi=23^\circ$
ML- $\phi=30^\circ$
SM,SP- $\phi=30^\circ, 33^\circ$

TYPICAL SOIL PROFILE

SOIL STRATIFICATION IS BASED ON GEOLOGIC PROFILE

SHEAR STRENGTH AND WET DENSITIES SEE PLATE 39

D	PILE SPACING IN DIRECTION OF LOADING
1.00	8B
0.85	7B
0.70	6B
0.55	5B
0.40	4B
0.25	3B
C	**LOADING CONDITION**
1.00	INITIAL LOADING
0.30	CYCLIC LOADING

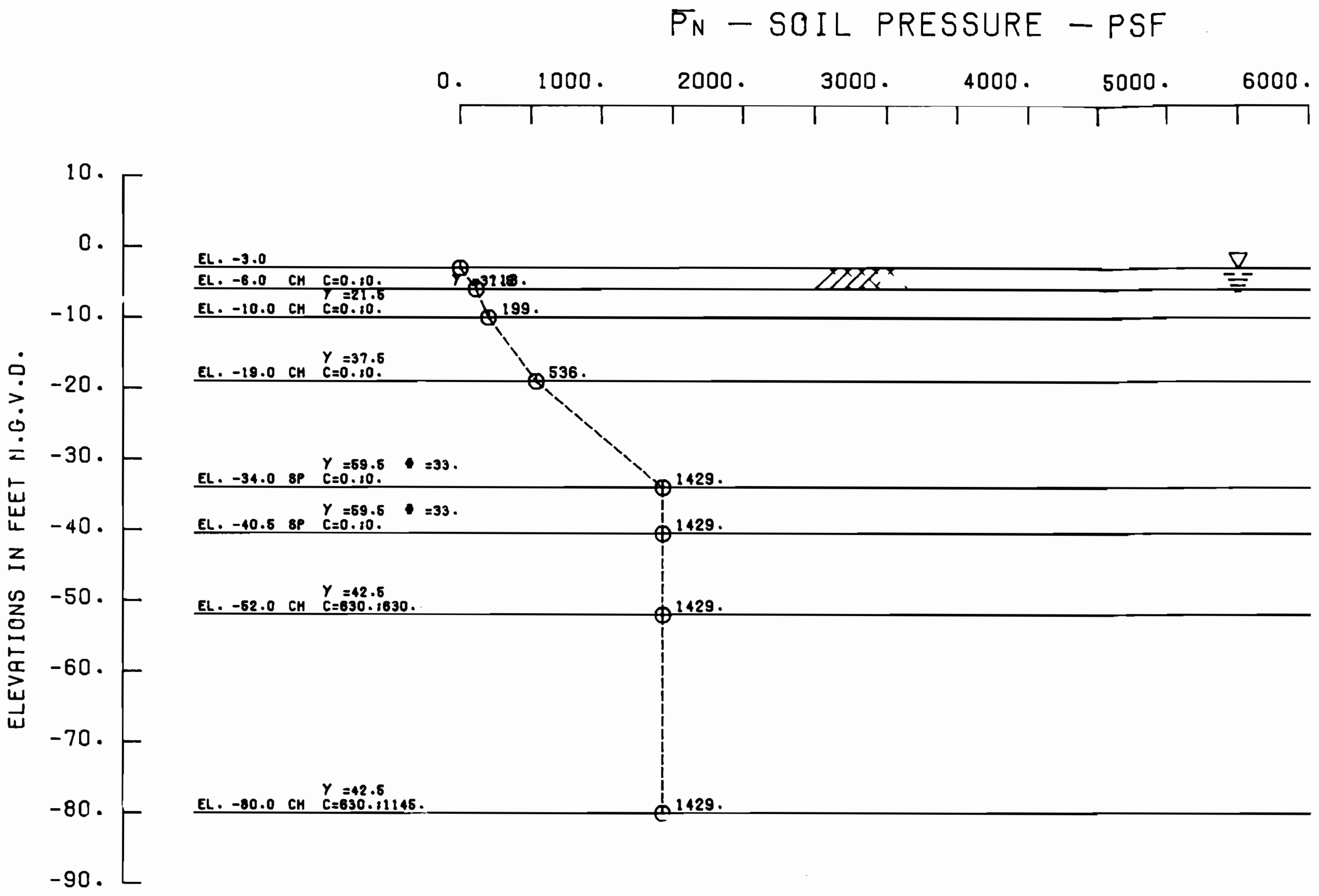
NOTES: $K_H = \alpha K_1/B = (0.2222\,qu/B)(C)(D)$ COHESIVE
α = 0.4 = Factor of material properties of soil and pile
k_1 = Modulus of subgrade reaction for test plate (pci)
B_1 = Width or diameter of test plate (in)
$K_1 = k_1 B_1$ = 80 qu (psf) = 0.5556 qu (psi)
qu = 2·c = Unconfined compressive strength (psf)
C = Reduction for cyclic loading-not applicable
D = Group effect reduction factor
B = Width of pile measured at right angles to the direction of displacement (in)
$K_H = (nh)(Z/B)(C)(D)$ COHESIONLESS
nh = Coefficient of horizontal subgrade reaction (pci)
Z = Depth below equivalent ground surface (in)

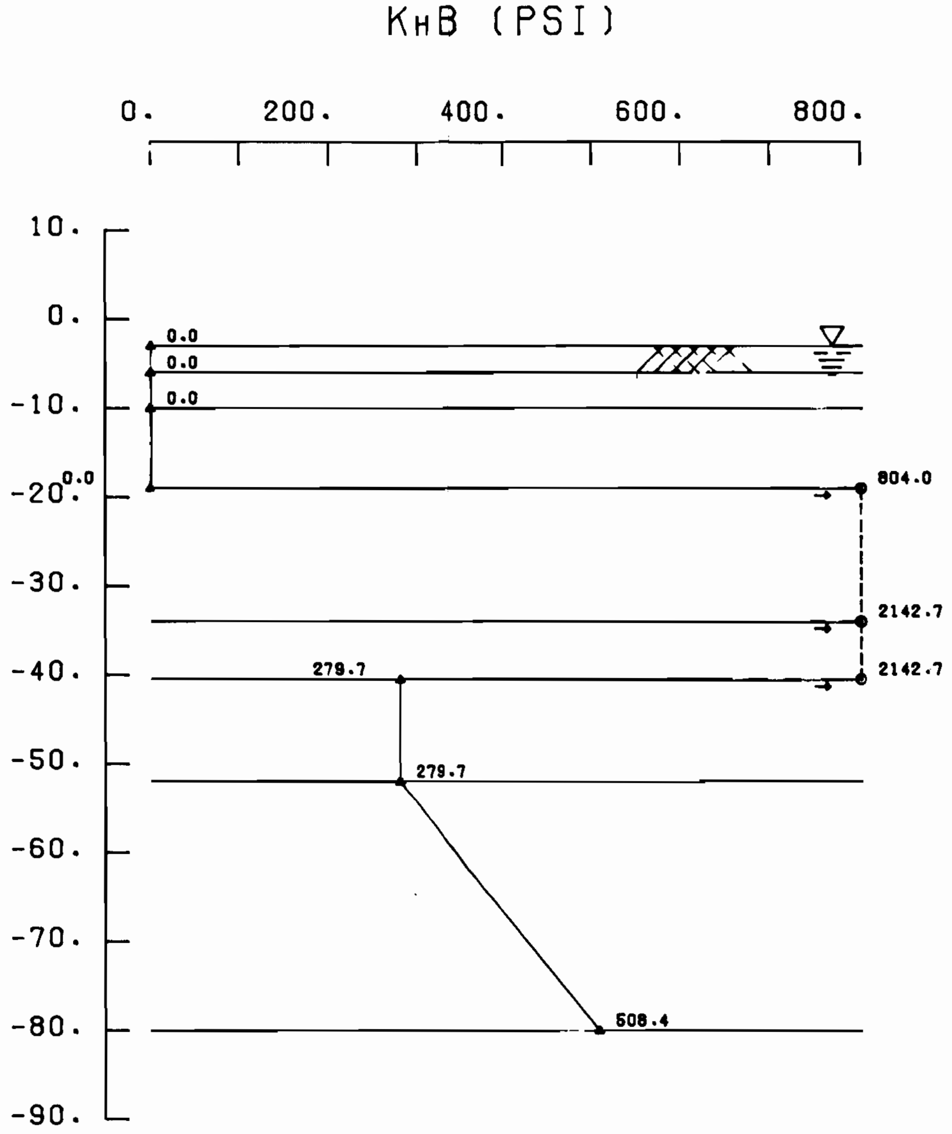
THE FACTOR SHOWN, (MODULUS OF HORIZONTAL SUBGRADE K_h, TIMES THE PILE WIDTH IN INCHES (B), MEASURED AT RIGHT ANGLES TO THE DIRECTION OF DISPLACEMENT) MUST BE MODIFIED BY A REDUCTION FACTOR FOR THE EFFECT OF GROUP ACTION (D) AND A REDUCTION FACTOR FOR CYCLIC LOADING (C) EX: $K_h = \frac{0.2222\,qu\,(C)(D)}{(B)}$

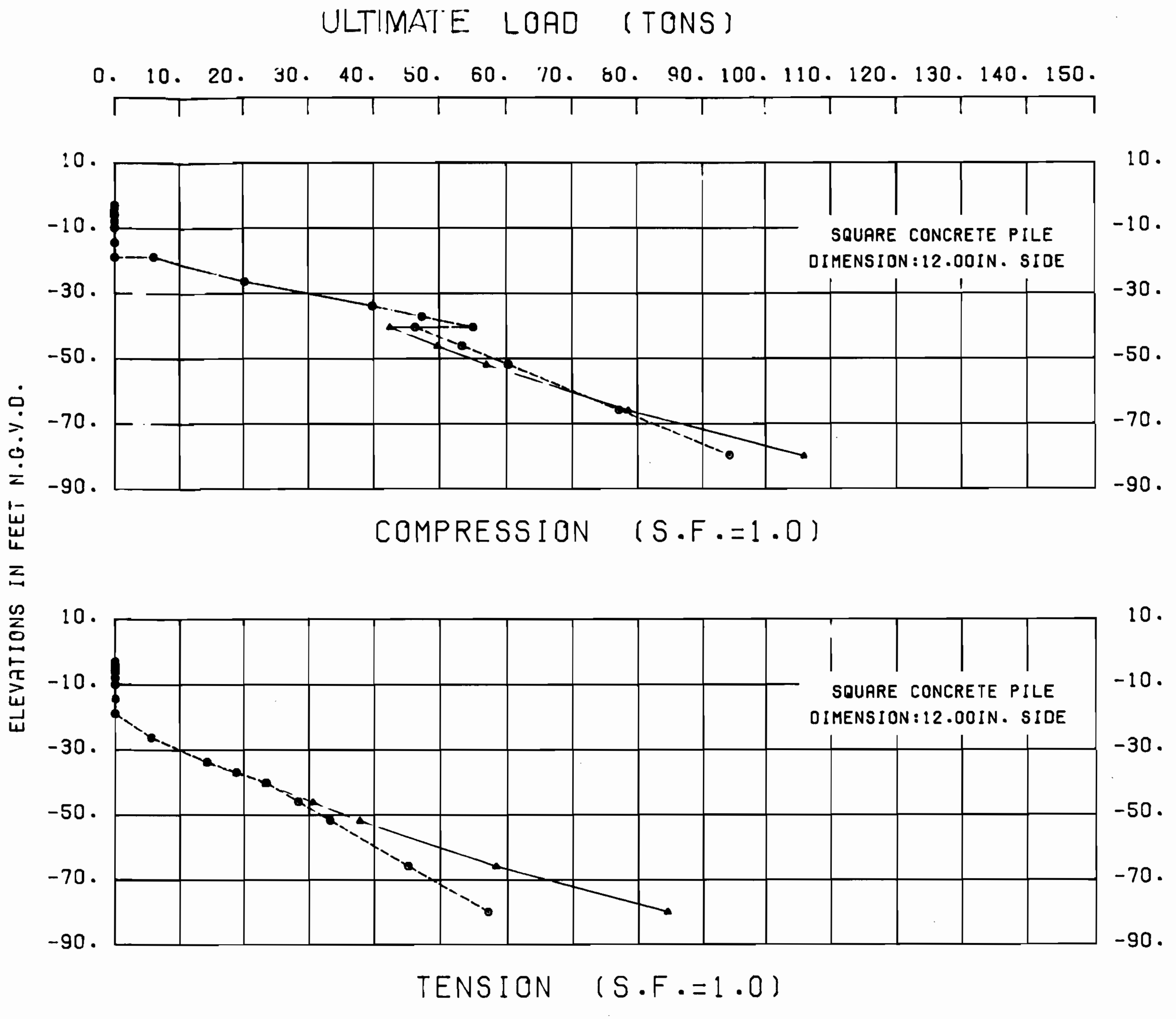
----- S-CASE
——— Q-CASE

NOTE: ALLOWABLE CAPACITIES SHOULD BE DETERMINED INCORPORATING F.S.=2.0 WITH PILE TEST OR F.S.=3.0 WITHOUT PILE TEST

LAKE PONTCHARTRAIN, LA AND VICINITY
HIGH LEVEL PLAN
DESIGN MEMORANDUM NO.19 GENERAL DESIGN
ORLEANS AVENUE OUTFALL CANAL
FLOODGATE HARRISON AVE
12" SQUARE PRESTRESSED CONCRETE PILES
PILE CAPACITY CURVES
U.S. ARMY ENGINEER DISTRICT, NEW ORLEANS
CORPS OF ENGINEERS
JUNE, 1988 FILE NO. H-2-30290







S-CASE

CH,CL- ϕ=23°

ML- ϕ=30°

SM,SP- ϕ=30°, 33°

TYPICAL SOIL PROFILE

SOIL STRATIFICATION IS BASED ON GEOLOGIC PROFILE

SHEAR STRENGTH AND WET DENSITIES SEE PLATE 39

D	PILE SPACING IN DIRECTION OF LOADING
1.00	8B
0.85	7B
0.70	6B
0.55	5B
0.40	4B
0.25	3B
C	**LOADING CONDITION**
1.00	INITIAL LOADING
0.30	CYCLIC LOADING

NOTES: $K_H = \alpha K_1/B = (0.2222 qu/B)(C)(D)$ COHESIVE

α = 0.4 = Factor of material properties of soil and pile

k_1 = Modulus of subgrade reaction for test plate (pci)

B_1 = Width or diameter of test plate (in)

$K_1 = k_1 B_1$ = 80 qu (psf) = 0.5556 qu (psi)

qu = 2·c = Unconfined compressive strength (psf)

C = Reduction for cyclic loading-not applicable

D = Group effect reduction factor

B = Width of pile measured at right angles to the direction of displacement (in)

$K_H = (nh)(Z/B)(C)(D)$ COHESIONLESS

nh = Coefficient of horizontal subgrade reaction (pci)

Z = Depth below equivalent ground surface (in)

THE FACTOR SHOWN, (MODULUS OF HORIZONTAL SUBGRADE K_h, TIMES THE PILE WIDTH IN INCHES (B), MEASURED AT RIGHT ANGLES TO THE DIRECTION OF DISPLACEMENT) MUST BE MODIFIED BY A REDUCTION FACTOR FOR THE EFFECT OF GROUP ACTION (D) AND A REDUCTION FACTOR FOR CYCLIC LOADING (C) EX: $K_h = \frac{0.2222\, qu\, (C)(D)}{(B)}$

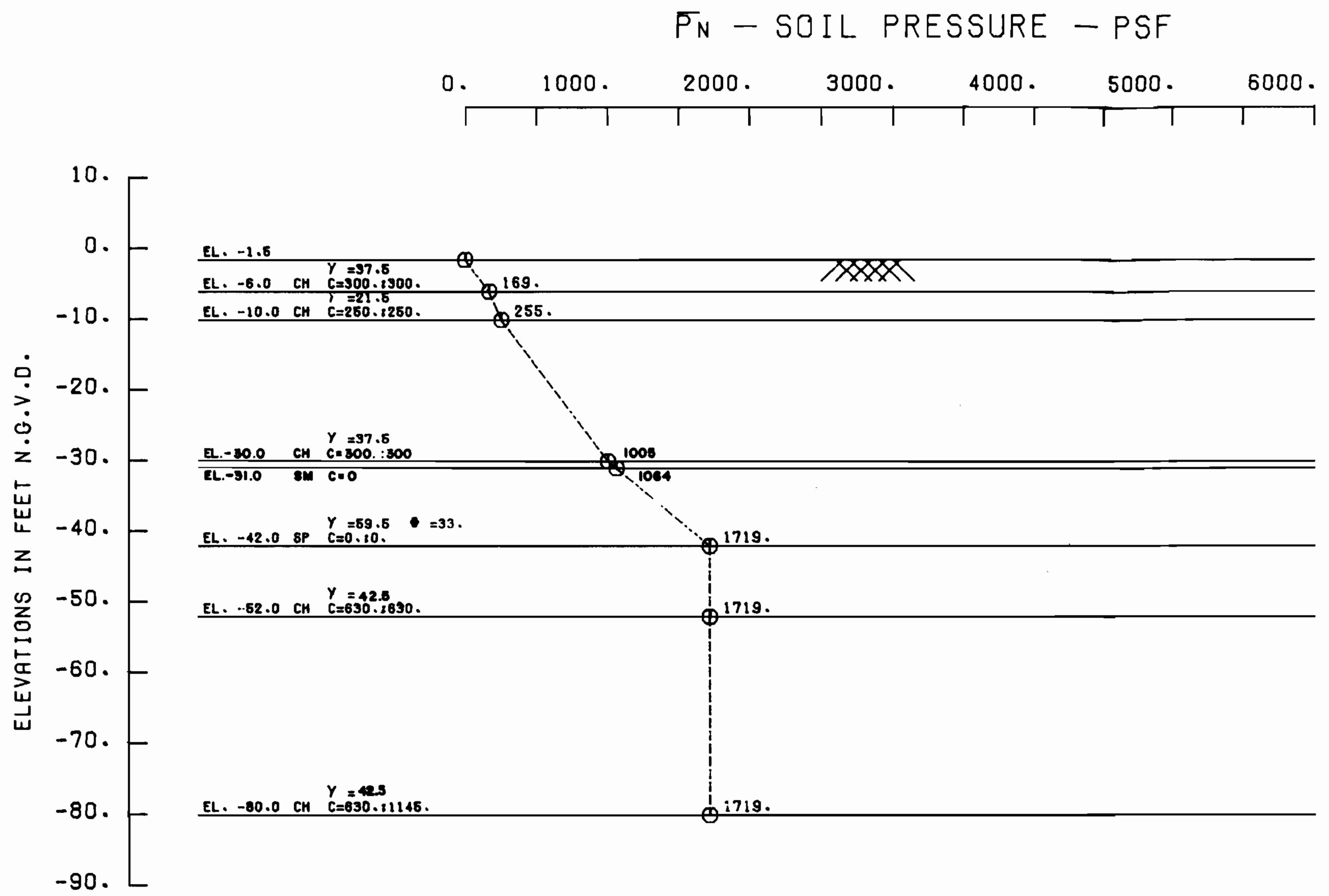
- - - - - S-CASE

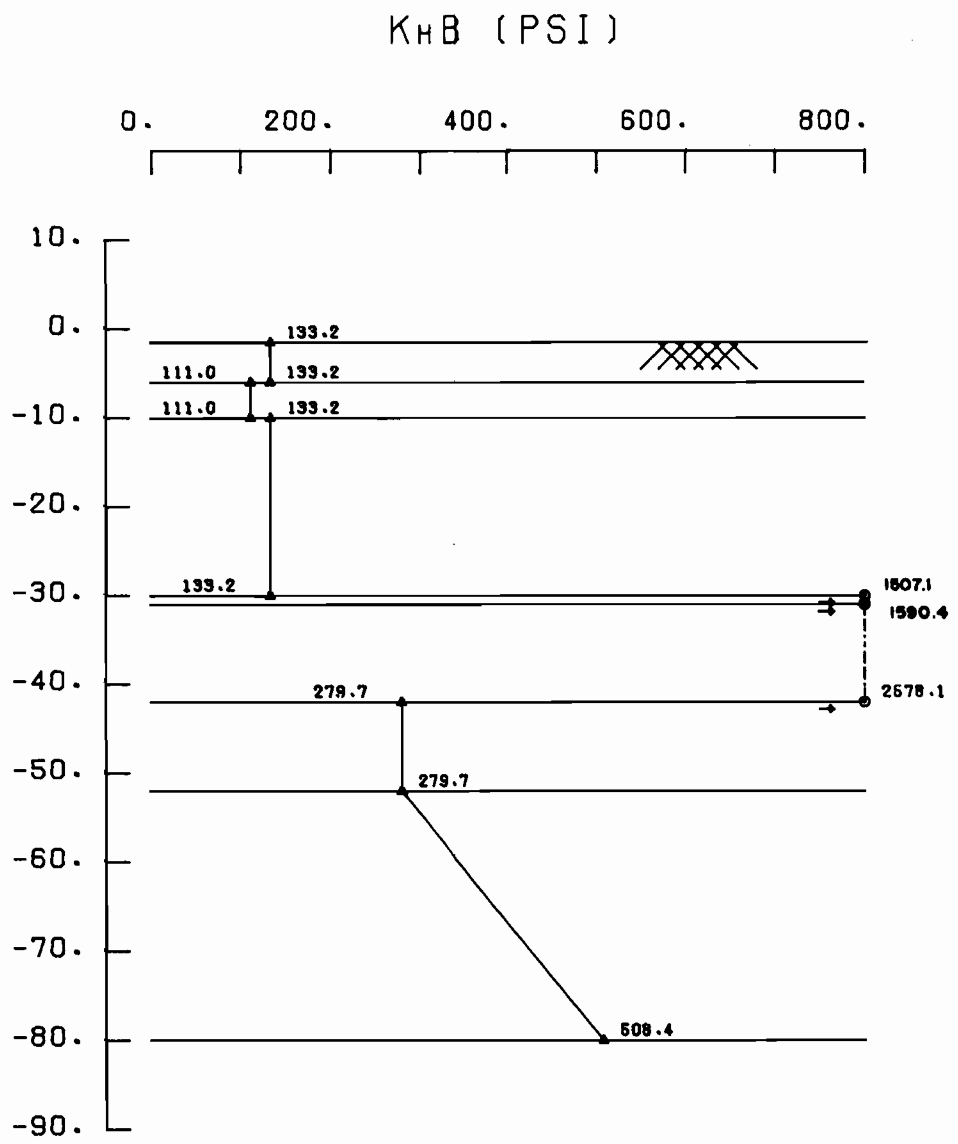
———— Q-CASE

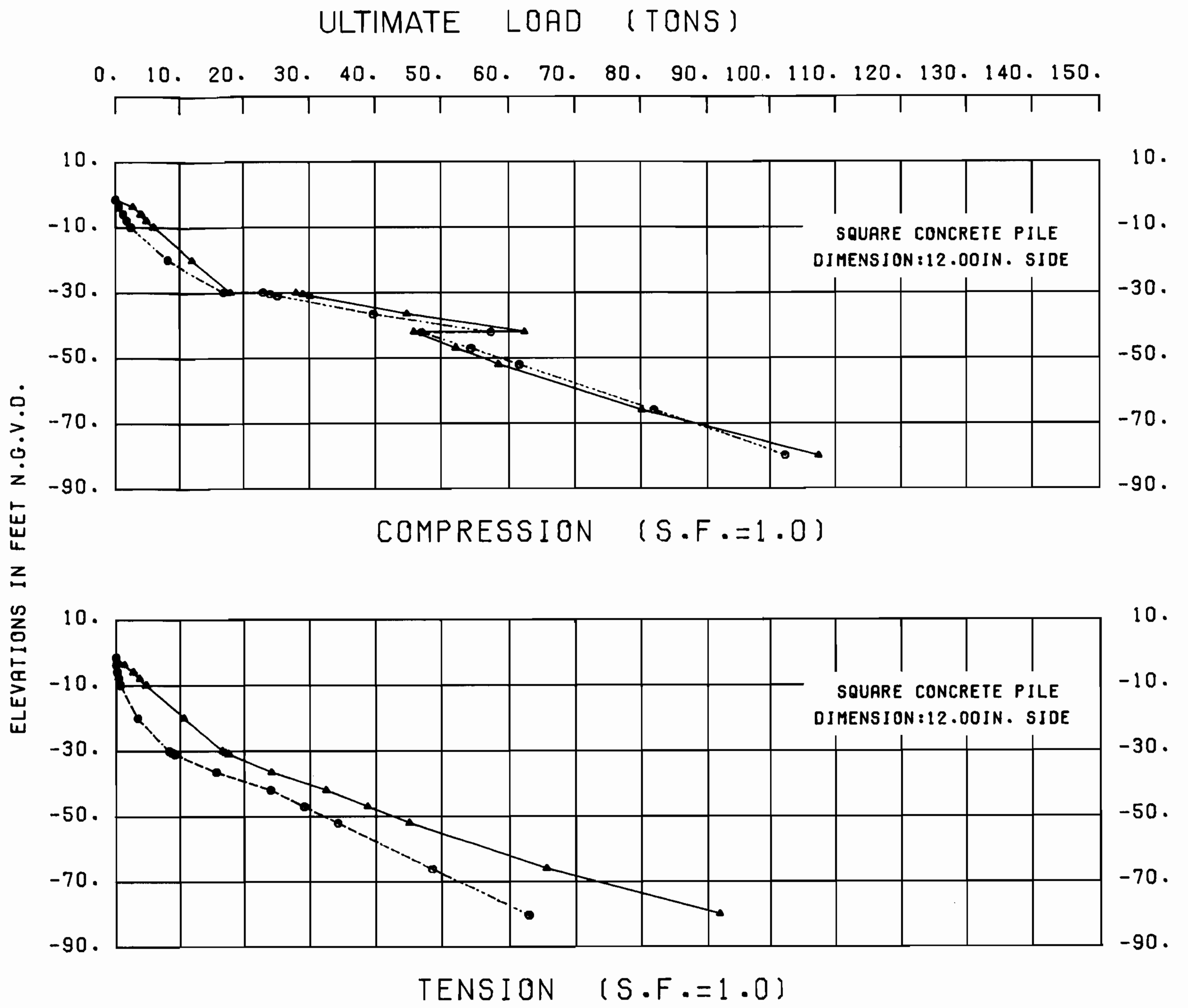
NOTE: ALLOWABLE CAPACITIES SHOULD BE DETERMINED INCORPORATING F.S. = 2.0 WITH PILE TEST OR F.S. = 3.0 WITHOUT PILE TEST

LAKE PONTCHARTRAIN, LA. AND VICINITY
HIGH LEVEL PLAN
DESIGN MEMORANDUM NO. 19 - GENERAL DESIGN
ORLEANS AVENUE OUTFALL CANAL
STA. 22 + 80 TO STA. 23 + 40, STA. 29 + 40 TO STA. 50 + 00 WEST SIDE
12" SQUARE PRESTRESSED CONCRETE PILES
PILE CAPACITY CURVES
U.S. ARMY ENGINEER DISTRICT, NEW ORLEANS
CORPS OF ENGINEERS

JUNE 1988 FILE NO. H-2-30290







S-CASE

CH,CL- ϕ=23°

ML- ϕ=30°

SM,SP- ϕ=30°,33°

TYPICAL SOIL PROFILE

SOIL STRATIFICATION IS BASED ON GEOLOGIC PROFILE

SHEAR STRENGTH AND WET DENSITIES SEE PLATE 39

D	PILE SPACING IN DIRECTION OF LOADING
1.00	8B
0.85	7B
0.70	6B
0.55	5B
0.40	4B
0.25	3B
C	**LOADING CONDITION**
1.00	INITIAL LOADING
0.30	CYCLIC LOADING

NOTES: $K_H = \alpha K_1/B = (0.2222\,qu/B)(C)(D)$ COHESIVE

α = 0.4 = Factor of material properties of soil and pile

k_1 = Modulus of subgrade reaction for test plate (pci)

B_1 = Width or diameter of test plate (in)

$K_1 = k_1 B_1$ = 80 qu (psf) = 0.5556 qu (psi)

qu = 2·c = Unconfined compressive strength (psf)

C = Reduction for cyclic loading-not applicable

D = Group effect reduction factor

B = Width of pile measured at right angles to the direction of displacement (in)

K_H = (nh)(Z/B)(C)(D) COHESIONLESS

nh = Coefficient of horizontal subgrade reaction (pci)

Z = Depth below equivalent ground surface (in)

THE FACTOR SHOWN, (MODULUS OF HORIZONTAL SUBGRADE K_h, TIMES THE PILE WIDTH IN INCHES (B), MEASURED AT RIGHT ANGLES TO THE DIRECTION OF DISPLACEMENT) MUST BE MODIFIED BY A REDUCTION FACTOR FOR THE EFFECT OF GROUP ACTION (D) AND A REDUCTION FACTOR FOR CYCLIC LOADING (C) EX: $K_h = \frac{0.2222\,qu\,(C)(D)}{(B)}$

----- S-CASE

——— Q-CASE

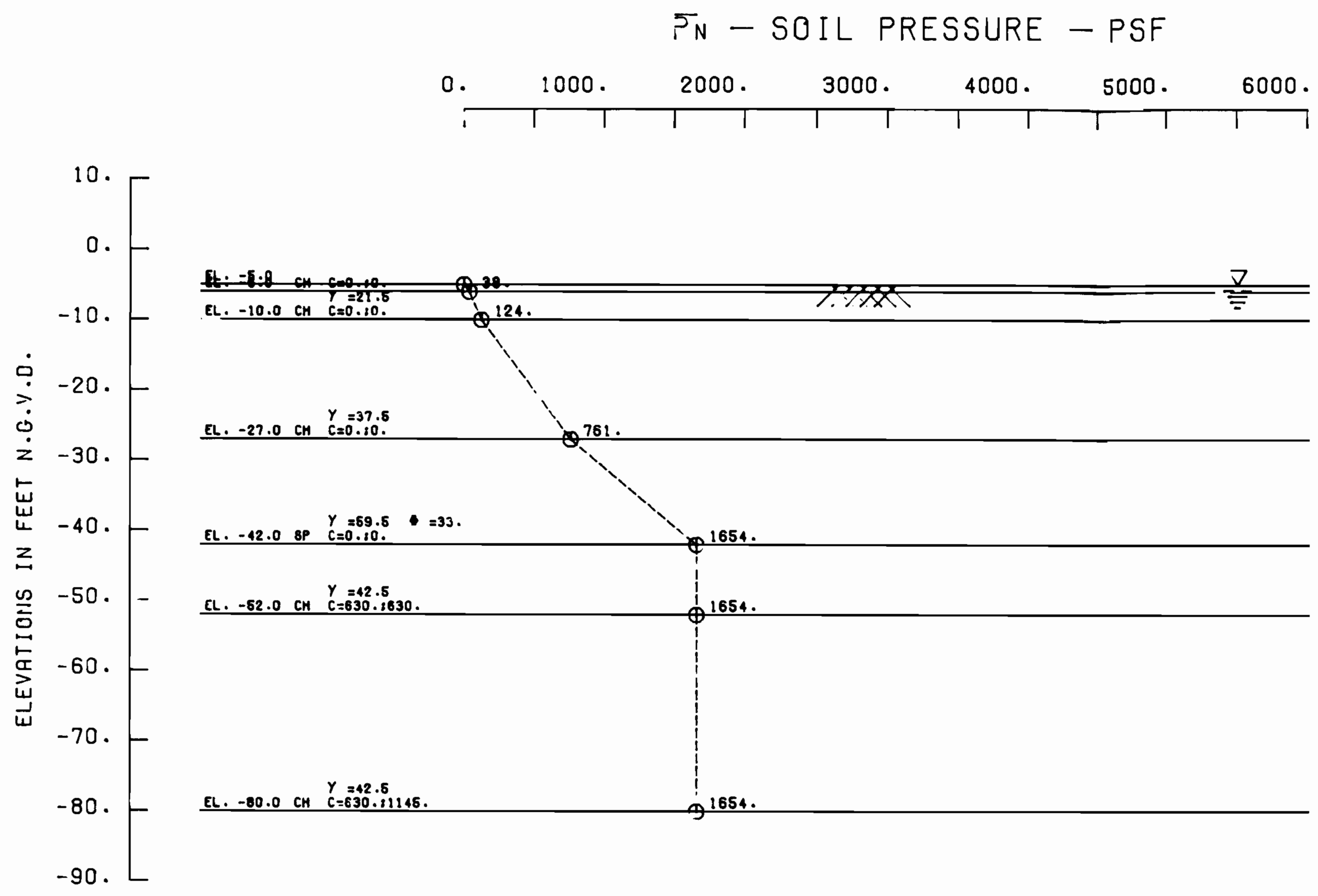
NOTE: ALLOWABLE CAPACITIES SHOULD BE DETERMINED INCORPORATING F.S.=2.0 WITH PILE TEST OR F.S.=3.0 WITHOUT PILE TEST

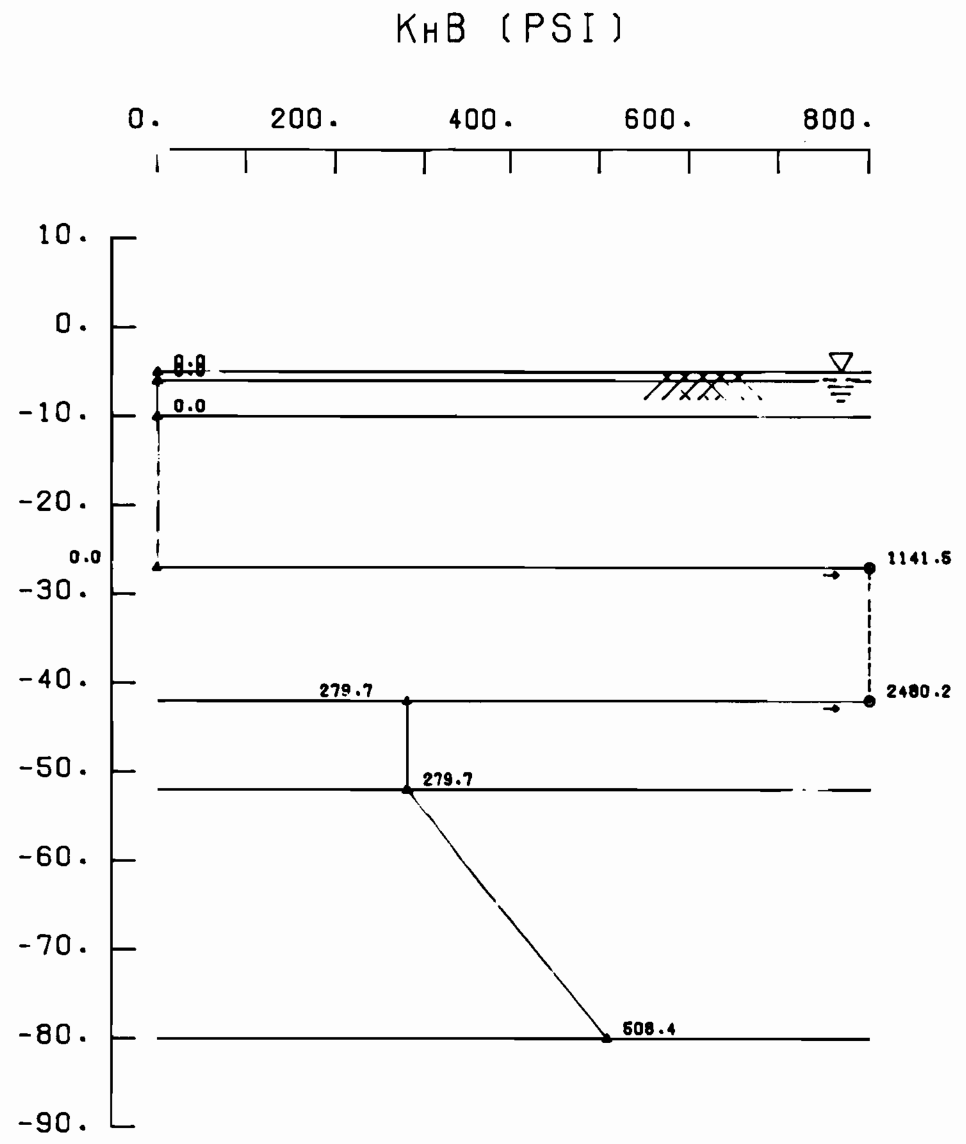
LAKE PONTCHARTRAIN, LA. AND VICINITY
HIGH LEVEL PLAN
DESIGN MEMORANDUM NO. 19 GENERAL DESIGN
ORLEANS AVENUE OUTFALL CANAL

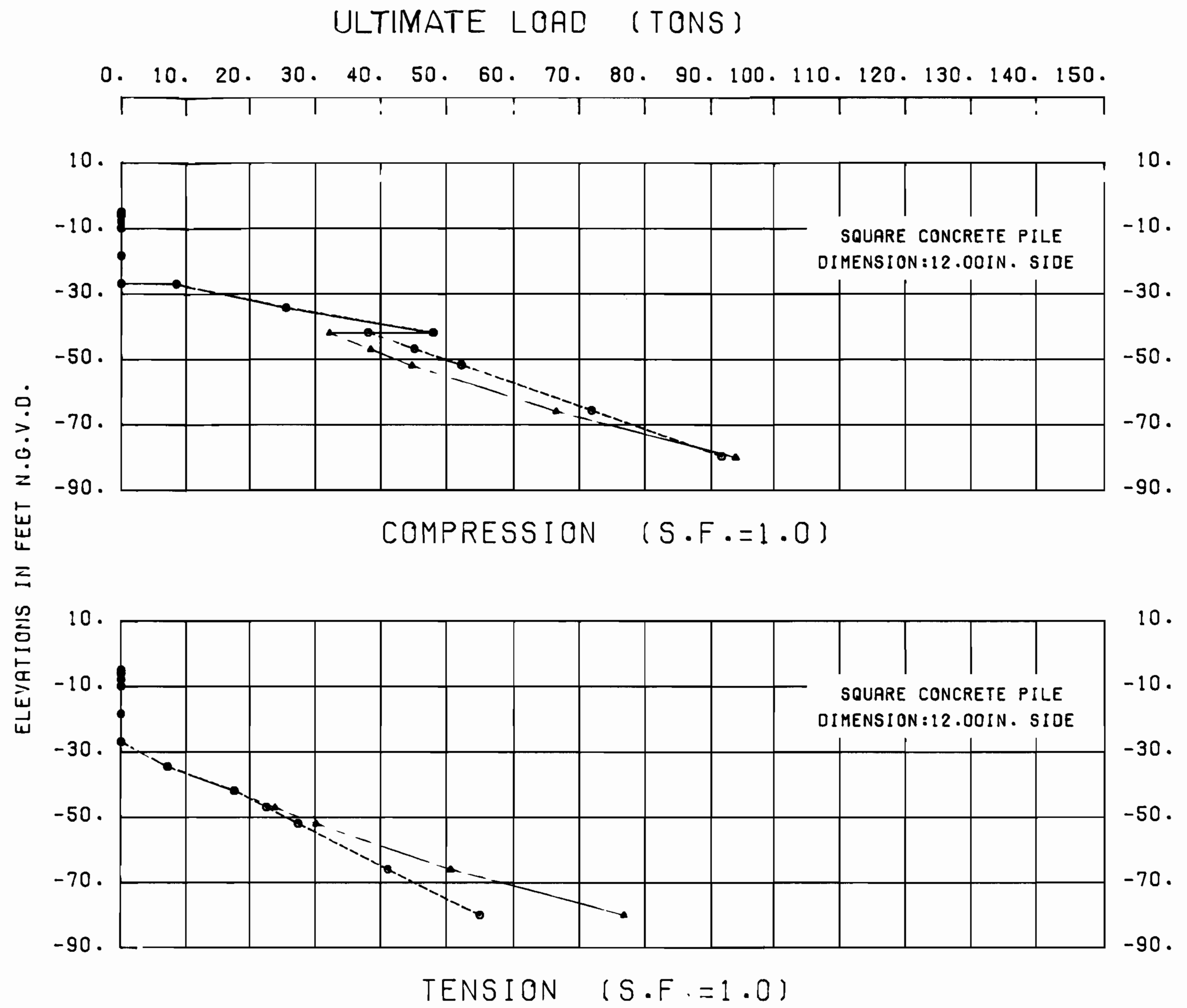
FLOODGATE FILMORE AVE
12" SQUARE PRESTRESSED CONCRETE PILES
PILE CAPACITY CURVES

U.S. ARMY ENGINEER DISTRICT, NEW ORLEANS
CORPS OF ENGINEERS

JUNE, 1988 FILE NO. H-2-30290







S-CASE

CH,CL- Φ=23°

ML- Φ=30°

SM,SP- Φ=30°, 33°

TYPICAL SOIL PROFILE

SOIL STRATIFICATION IS BASED ON GEOLOGIC PROFILE

SHEAR STRENGTH AND WET DENSITIES SEE PLATE 39

D	PILE SPACING IN DIRECTION OF LOADING
1.00	8B
0.85	7B
0.70	6B
0.55	5B
0.40	4B
0.25	3B
C	LOADING CONDITION
1.00	INITIAL LOADING
0.30	CYCLIC LOADING

NOTES: $K_H = \alpha K_1/B = (0.2222\,qu/B)(C)(D)$ COHESIVE

α = 0.4 = Factor of material properties of soil and pile

k_1 = Modulus of subgrade reaction for test plate (pci)

B_1 = Width or diameter of test plate (in)

$K_1 = k_1 B_1$ = 80 qu (psf) = 0.5556 qu (psi)

qu = 2·c = Unconfined compressive strength (psf)

C = Reduction for cyclic loading-not applicable

D = Group effect reduction factor

B = Width of pile measured at right angles to the direction of displacement (in)

K_H = (nh)(Z/B)(C)(D) COHESIONLESS

nh = Coeficcient of horizontal subgrade reaction (pci)

Z = Depth below equivalent ground surface (in)

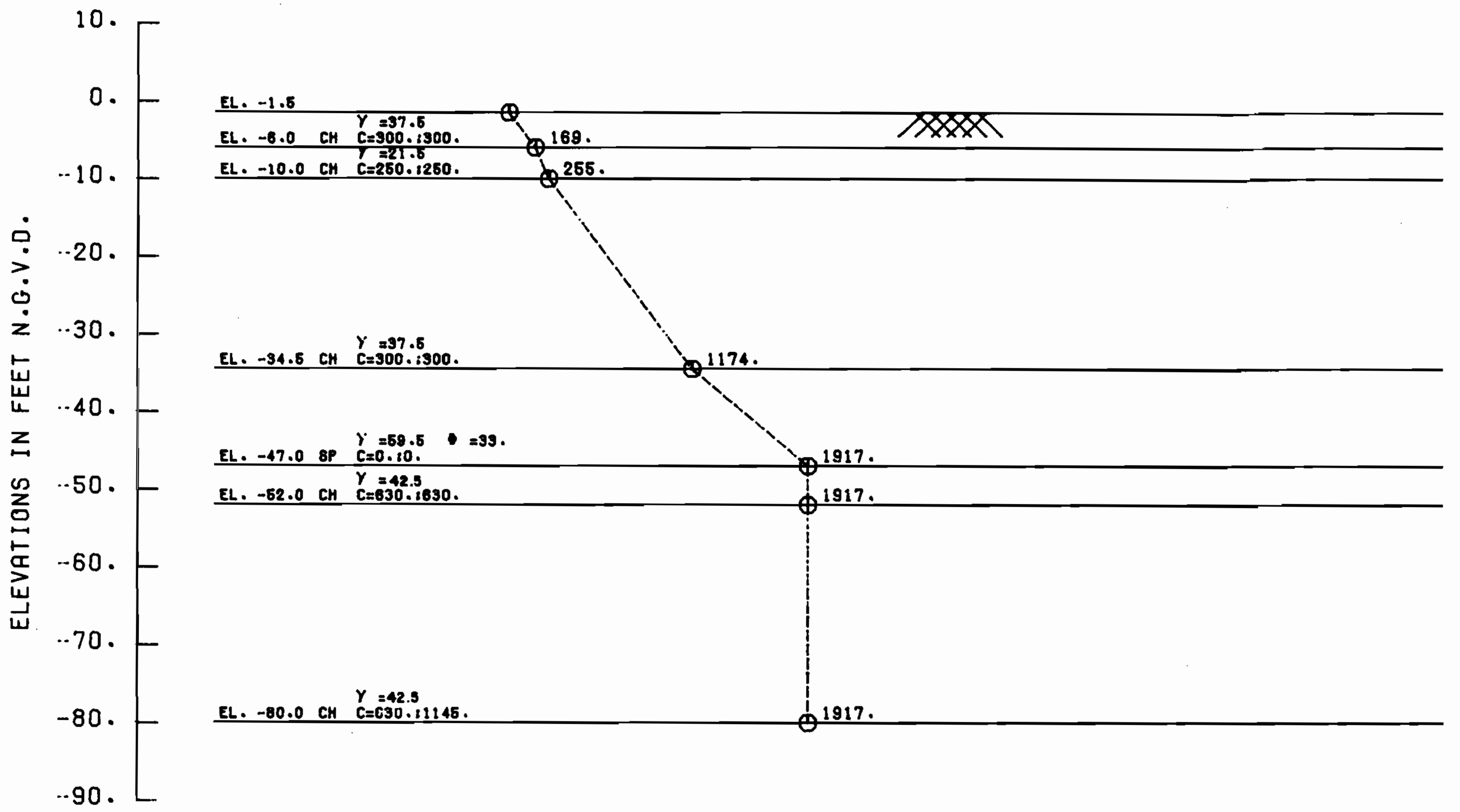
THE FACTOR SHOWN, (MODULUS OF HORIZONTAL SUBGRADE K_h, TIMES THE PILE WIDTH IN INCHES (B), MEASURED AT RIGHT ANGLES TO THE DIRECTION OF DISPLACEMENT) MUST BE MODIFIED BY A REDUCTION FACTOR FOR THE EFFECT OF GROUP ACTION (D) AND A REDUCTION FACTOR FOR CYCLIC LOADING (C) EX: $K_h = \frac{0.2222\,qu\,(C)(D)}{(B)}$

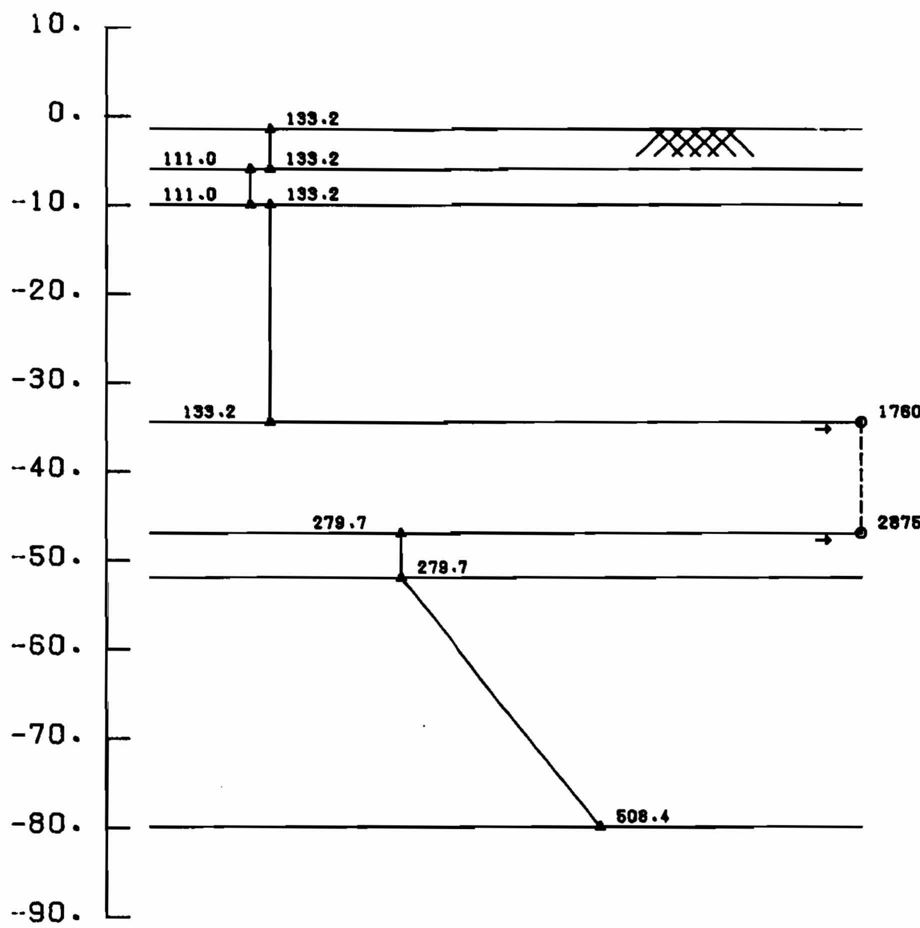
----- S-CASE

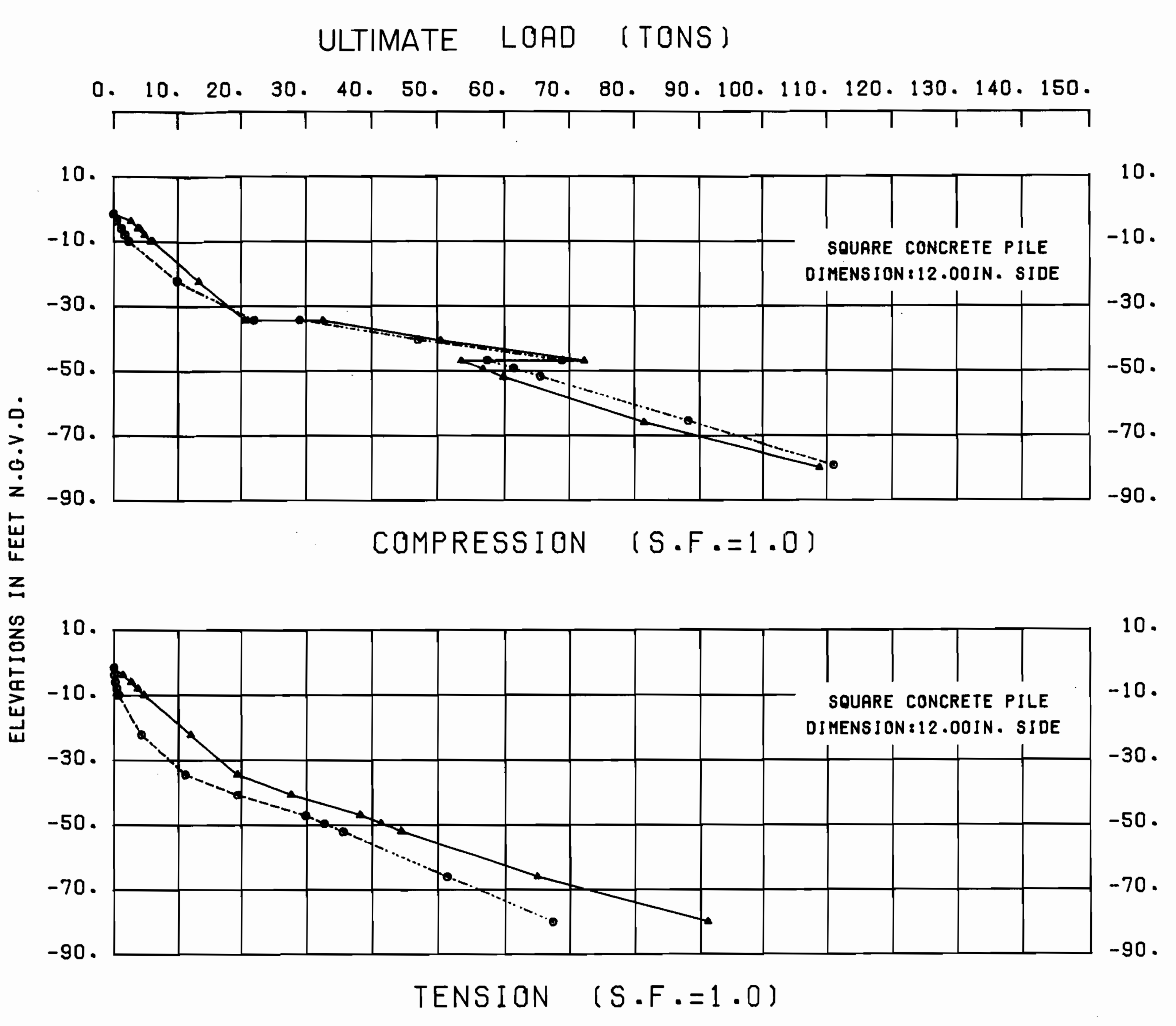
——— Q-CASE

NOTE: ALLOWABLE CAPACITIES SHOULD BE DETERMINED INCORPORATING F.S.=2.0 WITH PILE TEST OR F.S.=3.0 WITHOUT PILE TEST

LAKE PONTCHARTRAIN, LA. AND VICINITY
HIGH LEVEL PLAN
DESIGN MEMORANDUM NO. 19 GENERAL DESIGN
ORLEANS AVENUE OUTFALL CANAL
STA. 50+00 TO STA. 64+00 WEST SIDE
12" SQUARE PRESTRESSED CONCRETE PILES
PILE CAPACITY CURVES
U.S. ARMY ENGINEER DISTRICT, NEW ORLEANS
CORPS OF ENGINEERS
JUNE 1988 FILE NO. H-2-30290







S-CASE

CH,CL- Φ=23°

ML- Φ=30°

SM,SP- Φ=30°,33°

TYPICAL SOIL PROFILE

SOIL STRATIFICATION IS BASED ON GEOLOGIC PROFILE

SHEAR STRENGTH AND WET DENSITIES SEE PLATE 39

D	PILE SPACING IN DIRECTION OF LOADING
1.00	8B
0.85	7B
0.70	6B
0.55	5B
0.40	4B
0.25	3B
C	**LOADING CONDITION**
1.00	INITIAL LOADING
0.30	CYCLIC LOADING

NOTES: $K_H = \alpha K_1/B = (0.2222\,qu/B)(C)(D)$ COHESIVE

α = 0.4 = Factor of material properties of soil and pile

k_1 = Modulus of subgrade reaction for test plate (pci)

B_1 = Width or diameter of test plate (in)

$K_1 = k_1 B_1$ = 80 qu (psf) = 0.5556 qu (psi)

qu = 2·c = Unconfined compressive strength (psf)

C = Reduction for cyclic loading-not applicable

D = Group effect reduction factor

B = Width of pile measured at right angles to the direction of displacement (in)

K_H = (nh)(Z/B)(C)(D) COHESIONLESS

nh = Coefficient of horizontal subgrade reaction (pci)

Z = Depth below equivalent ground surface (in)

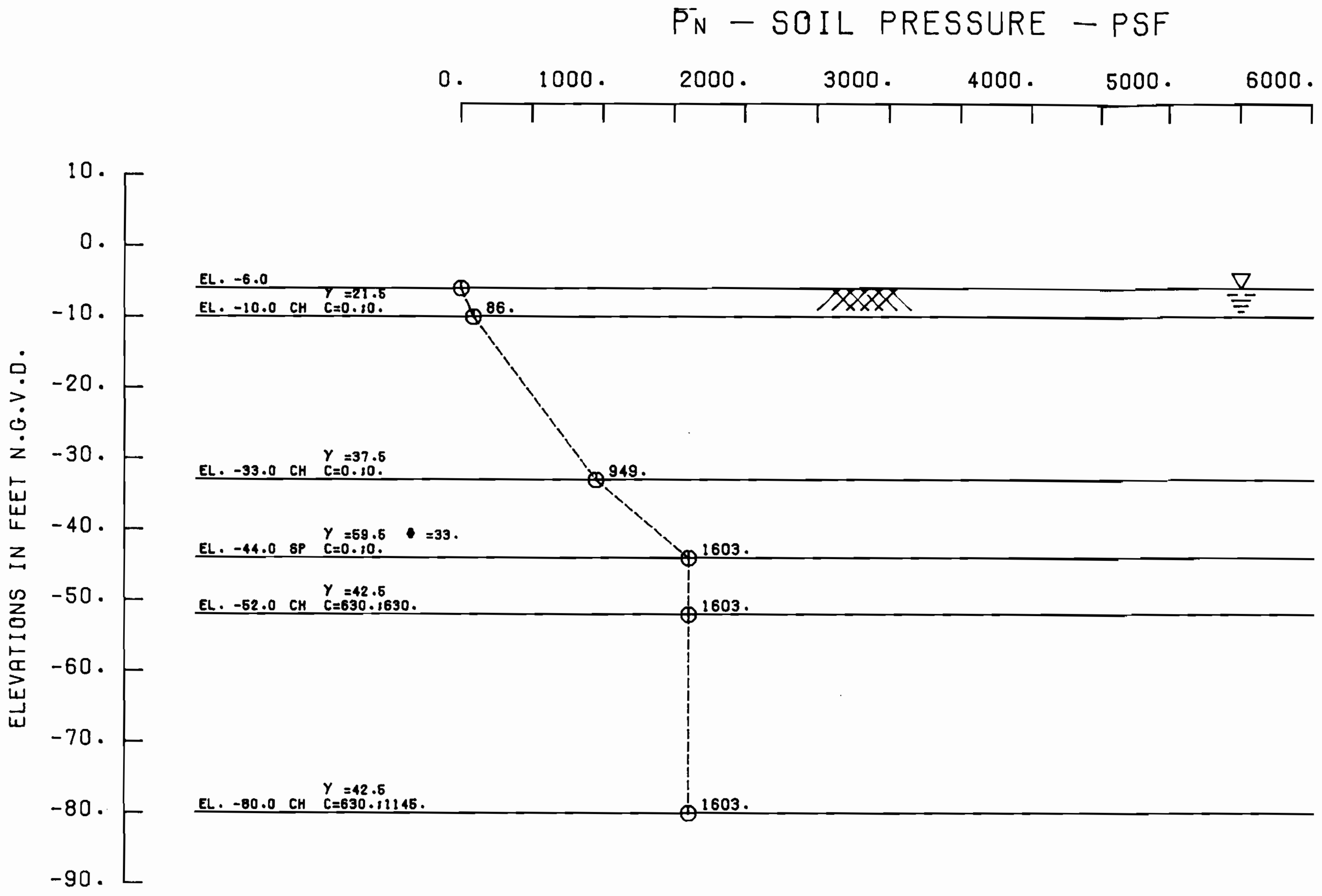
THE FACTOR SHOWN, (MODULUS OF HORIZONTAL SUBGRADE K_h, TIMES THE PILE WIDTH IN INCHES (B), MEASURED AT RIGHT ANGLES TO THE DIRECTION OF DISPLACEMENT) MUST BE MODIFIED BY A REDUCTION FACTOR FOR THE EFFECT OF GROUP ACTION (D) AND A REDUCTION FACTOR FOR CYCLIC LOADING (C) EX: $K_h = \frac{0.2222\,qu\,(C)(D)}{(B)}$

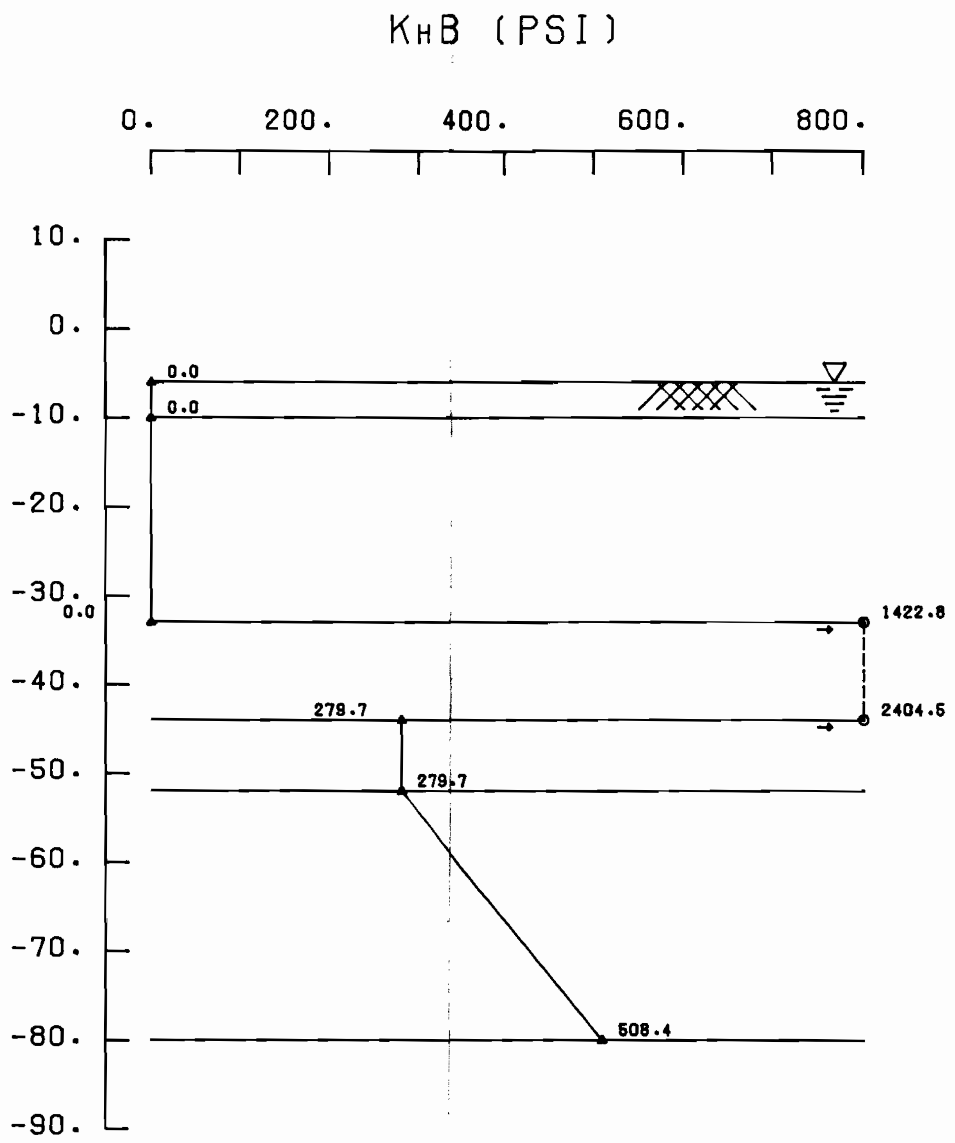
----- S-CASE

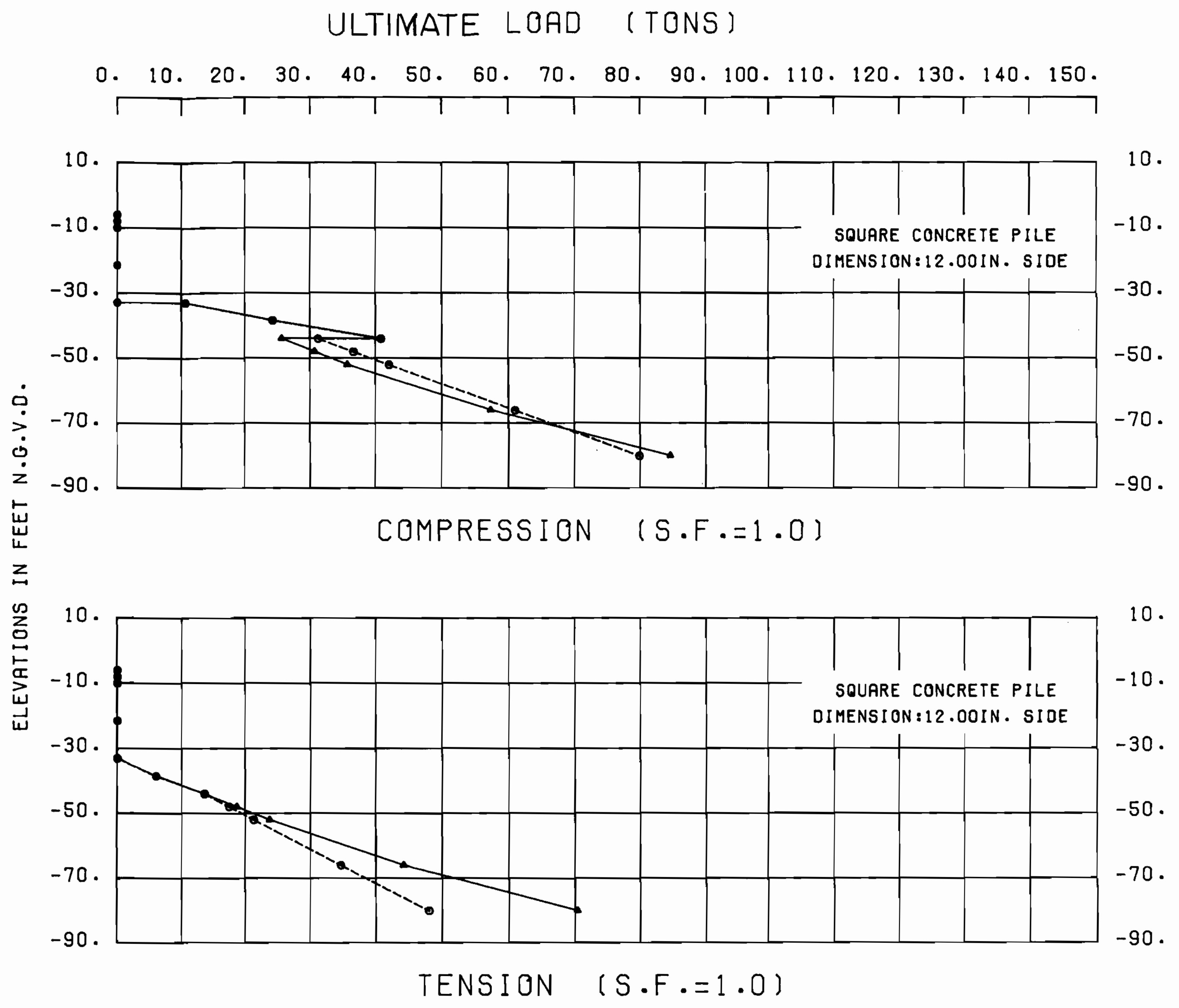
——— Q-CASE

NOTE: ALLOWABLE CAPACITIES SHOULD BE DETERMINED INCORPORATING F.S.=2.0 WITH PILE TEST OR F.S.=3.0 WITHOUT PILE TEST

LAKE PONTCHARTRAIN, LA. AND VICINITY
HIGH LEVEL PLAN
DESIGN MEMORANDUM NO. 19 GENERAL DESIGN
ORLEANS AVENUE OUTFALL CANAL
FLOODGATE ROBERT E. LEE BLVD
12" SQUARE PRESTRESSED CONCRETE PILES
PILE CAPACITY CURVES
U.S. ARMY ENGINEER DISTRICT, NEW ORLEANS
CORPS OF ENGINEERS
JUNE, 1988 FILE NO. H-2-30290







S-CASE
CH,CL- Φ=23°
ML- Φ=30°
SM,SP- Φ=30°, 33°

TYPICAL SOIL PROFILE

SOIL STRATIFICATION IS BASED ON GEOLOGIC PROFILE

SHEAR STRENGTH AND WET DENSITIES SEE PLATE 39

D	PILE SPACING IN DIRECTION OF LOADING
1.00	8B
0.85	7B
0.70	6B
0.55	5B
0.40	4B
0.25	3B
C	LOADING CONDITION
1.00	INITIAL LOADING
0.30	CYCLIC LOADING

NOTES: $K_H = \alpha K_1/B = (0.2222\,qu/B)(C)(D)$ COHESIVE

α = 0.4 = Factor of material properties of soil and pile

k_1 = Modulus of subgrade reaction for test plate (pci)

B_1 = Width or diameter of test plate (in)

$K_1 = k_1 B_1$ = 80 qu (psf) = 0.5556 qu (psi)

qu = 2·c = Unconfined compressive strength (psf)

C = Reduction for cyclic loading-not applicable

D = Group effect reduction factor

B = Width of pile measured at right angles to the direction of displacement (in)

$K_H = (nh)(Z/B)(C)(D)$ COHESIONLESS

nh = Coeficcient of horizontal subgrade reaction (pci)

Z = Depth below equivalent ground surface (in)

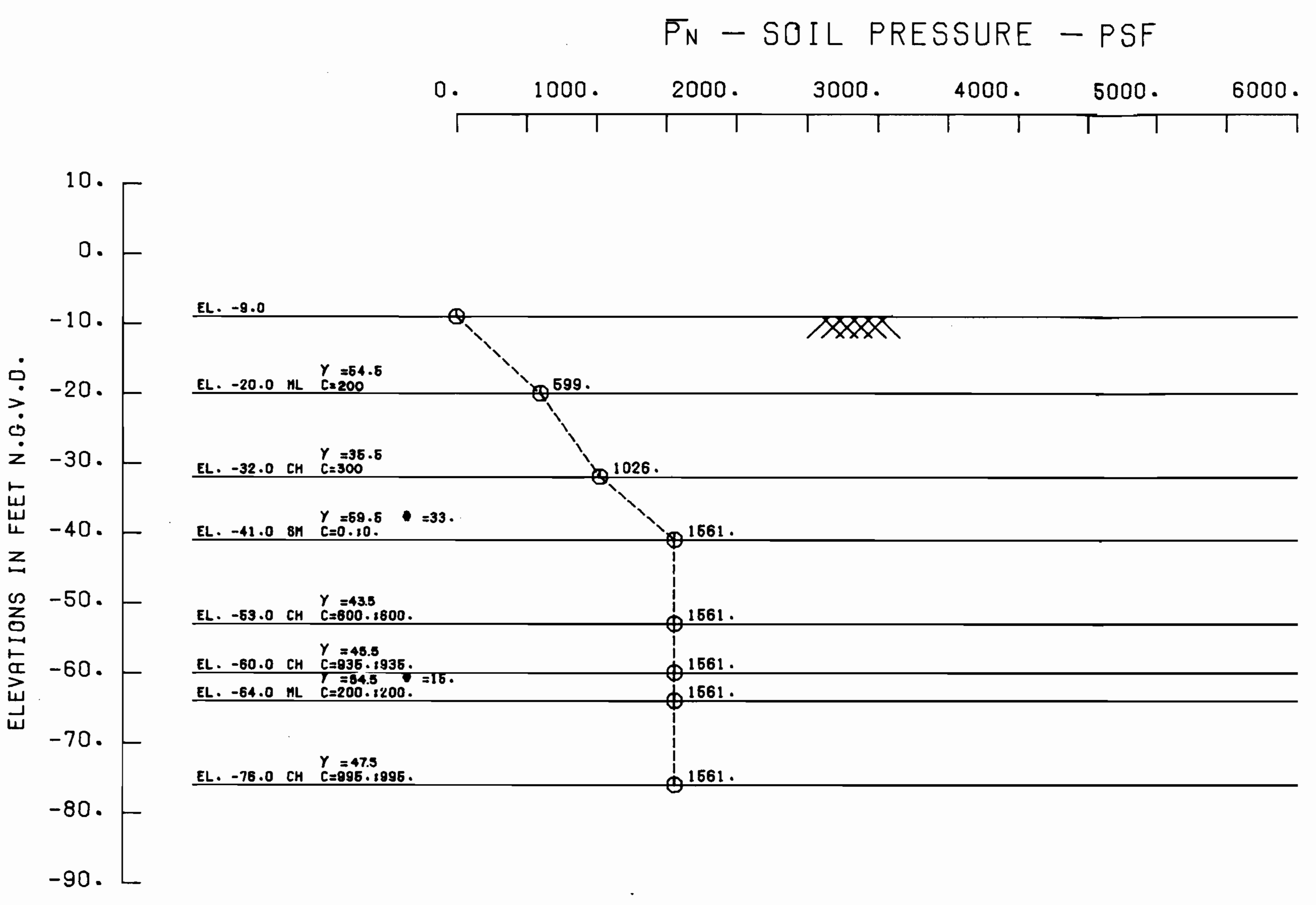
THE FACTOR SHOWN, (MODULUS OF HORIZONTAL SUBGRADE K_h, TIMES THE PILE WIDTH IN INCHES (B), MEASURED AT RIGHT ANGLES TO THE DIRECTION OF DISPLACEMENT) MUST BE MODIFIED BY A REDUCTION FACTOR FOR THE EFFECT OF GROUP ACTION (D) AND A REDUCTION FACTOR FOR CYCLIC LOADING (C) EX: $K_h = \frac{0.2222\,qu\,(C)(D)}{(B)}$

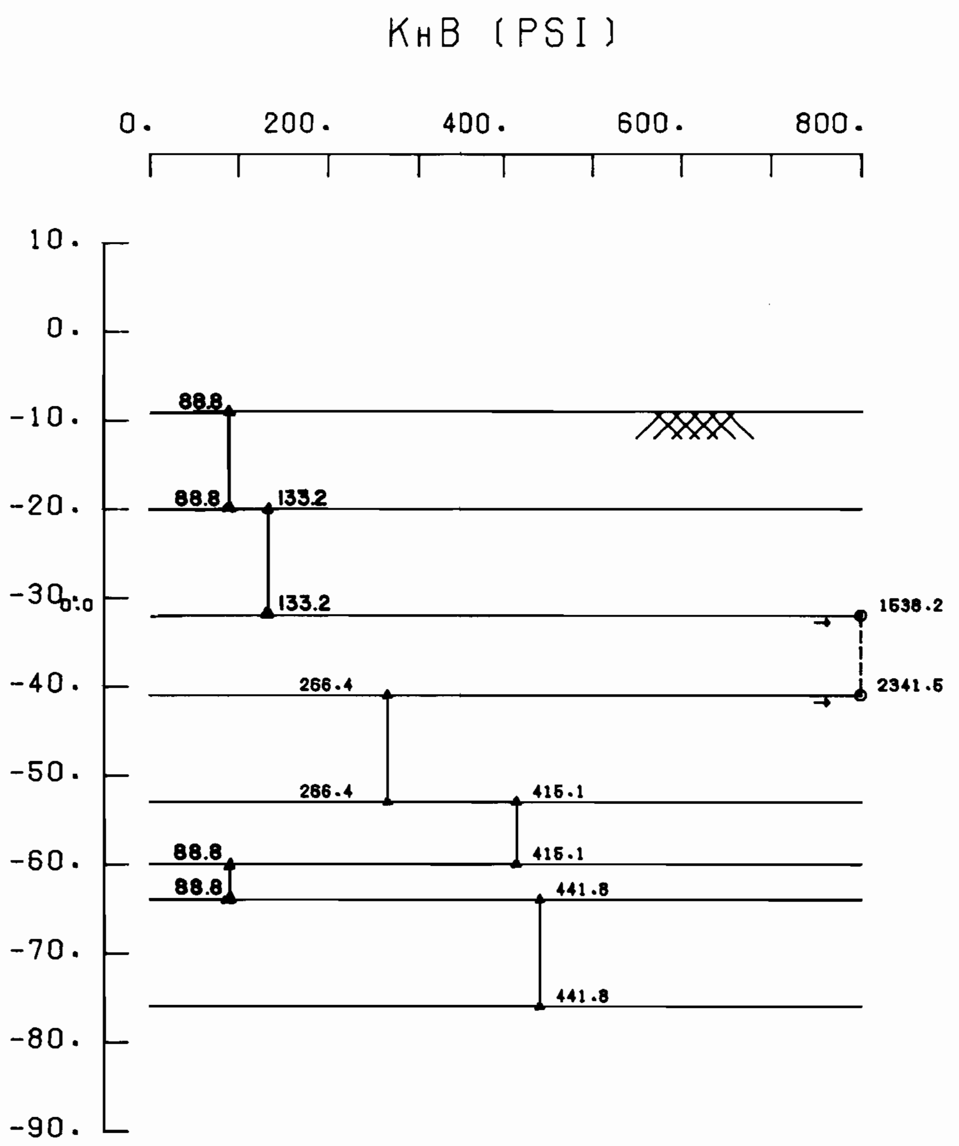
----- S-CASE

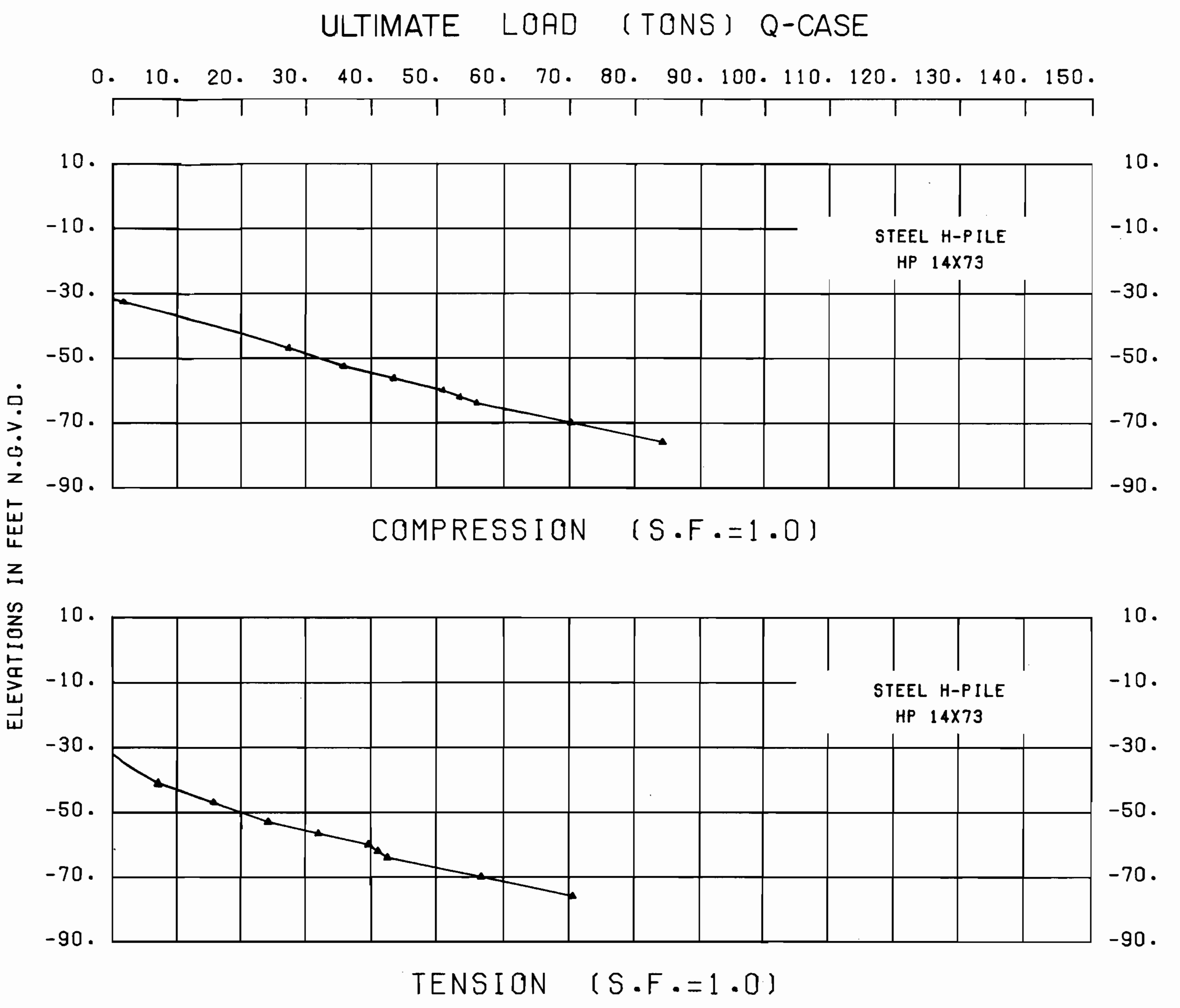
——— Q-CASE

NOTE: ALLOWABLE CAPACITIES SHOULD BE DETERMINED INCORPORATING F.S.= 2.0 WITH PILE TEST OR F.S.= 3.0 WITHOUT PILE TEST

LAKE PONTCHARTRAIN, LA. AND VICINITY
HIGH LEVEL PLAN
DESIGN MEMORANDUM NO. 19 GENERAL DESIGN
ORLEANS AVENUE OUTFALL CANAL
STA. 64+00 TO STA. 90+50 WEST SIDE
12" SQUARE PRESTRESSED CONCRETE PILES
PILE CAPACITY CURVES
U.S. ARMY ENGINEER DISTRICT, NEW ORLEANS
CORPS OF ENGINEERS
JUNE 1988 FILE NO. H-2-30290







TYPICAL SOIL PROFILE

SOIL STRATIFICATION IS BASED ON GEOLOGIC PROFILE

SHEAR STRENGTH AND WET DENSITIES SEE PLATE 40

D	PILE SPACING IN DIRECTION OF LOADING
1.00	8B
0.85	7B
0.70	6B
0.55	5B
0.40	4B
0.25	3B
C	**LOADING CONDITION**
1.00	INITIAL LOADING
0.30	CYCLIC LOADING

NOTES: $K_H = \alpha K_1/B = (0.2222\,qu/B)(C)(D)$ COHESIVE

- α = 0.4 = Factor of material properties of soil and pile
- k_1 = Modulus of subgrade reaction for test plate (pci)
- B_1 = Width or diameter of test plate (in)
- $K_1 = k_1 B_1$ = 80 qu (psf) = 0.5556 qu (psi)
- qu = 2·c = Unconfined compressive strength (psf)
- C = Reduction for cyclic loading-not applicable
- D = Group effect reduction factor
- B = Width of pile measured at right angles to the direction of displacement (in)

$K_H = (nh)(Z/B)(C)(D)$ COHESIONLESS

- nh = Coefficient of horizontal subgrade reaction (pci)
- Z = Depth below equivalent ground surface (in)

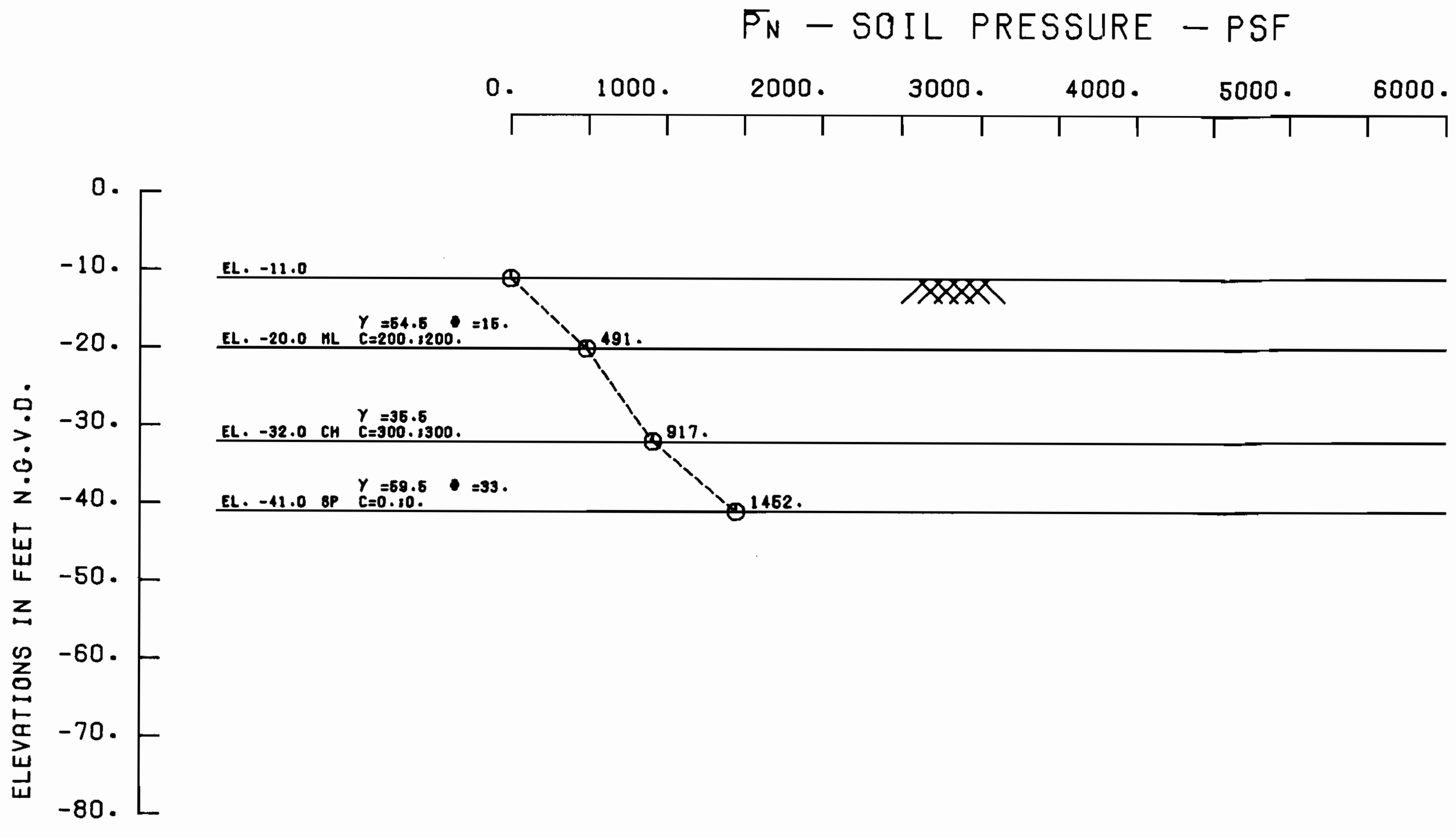
THE FACTOR SHOWN, (MODULUS OF HORIZONTAL SUBGRADE K_h, TIMES THE PILE WIDTH IN INCHES (B), MEASURED AT RIGHT ANGLES TO THE DIRECTION OF DISPLACEMENT) MUST BE MODIFIED BY A REDUCTION FACTOR FOR THE EFFECT OF GROUP ACTION (D) AND A REDUCTION FACTOR FOR CYCLIC LOADING (C) EX: $K_h = \frac{0.2222\,qu\,(C)(D)}{(B)}$

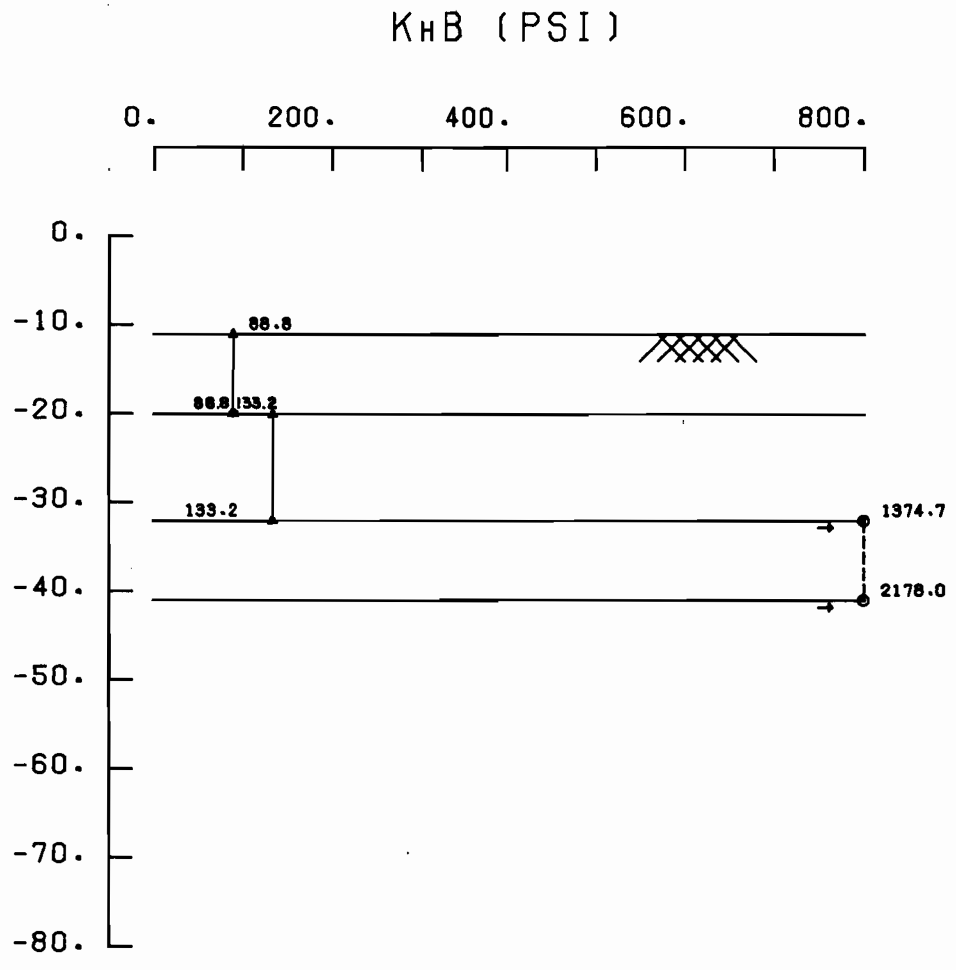
NOTE: ALLOWABLE CAPACITIES SHOULD BE DETERMINED INCORPORATING F.S.=2.0 WITH PILE TEST OR F.S. =3.0 WITHOUT PILE TEST

LAKE PONTCHARTRAIN, LA AND VICINITY
HIGH LEVEL PLAN
DESIGN MEMORANDUM NO. 19 GENERAL DESIGN
ORLEANS AVENUE OUTFALL CANAL

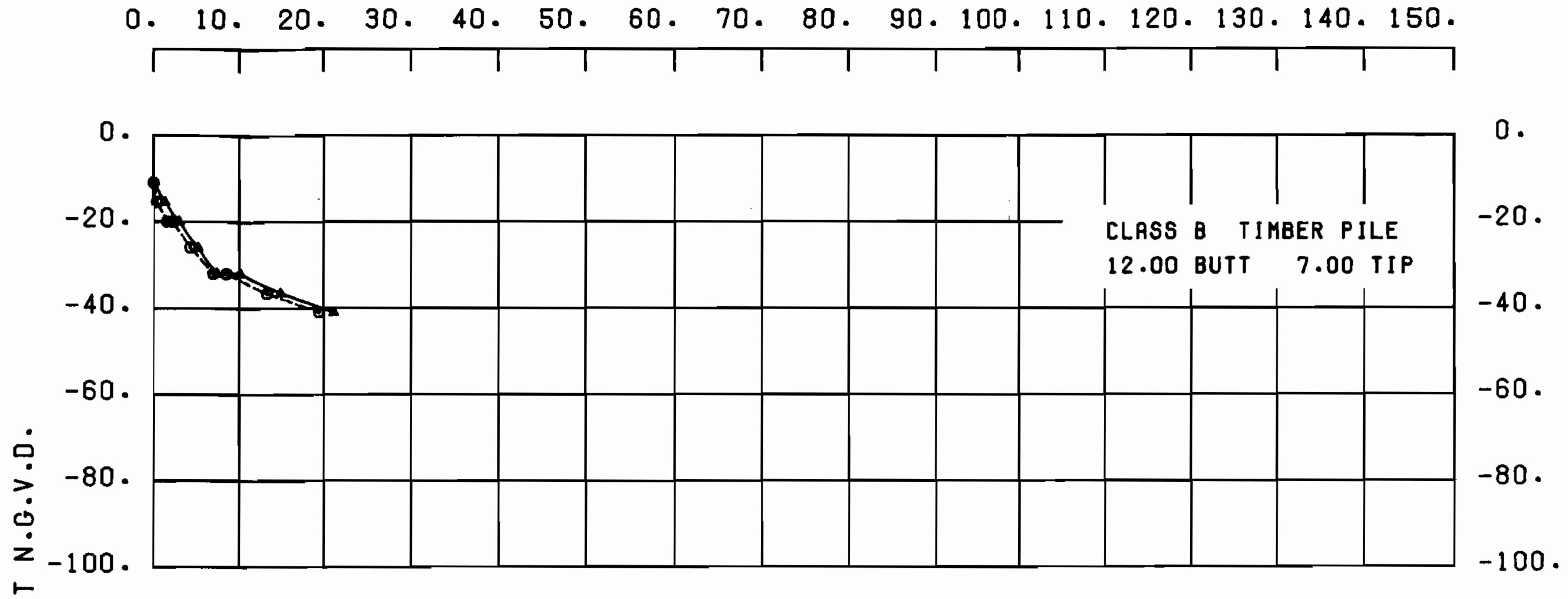
VALVE STRUCTURE EXCAVATION
STEEL HP14X73
PILE CAPACITY CURVES

U.S. ARMY ENGINEER DISTRICT, NEW ORLEANS
CORPS OF ENGINEERS
JUNE, 1988 FILE NO H-2-30290

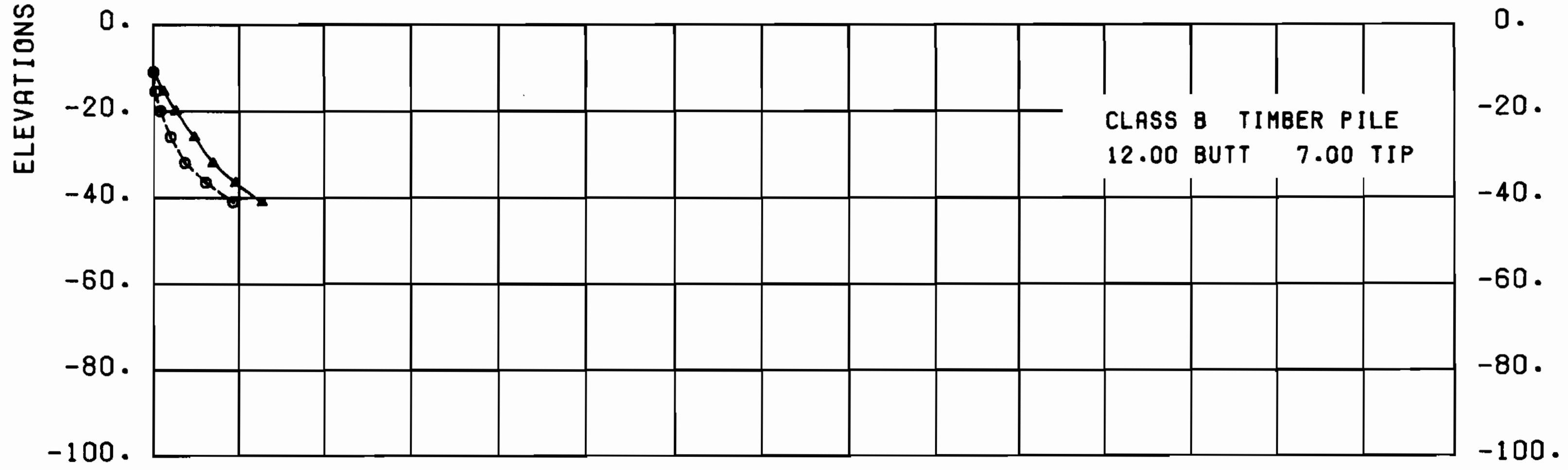




ULTIMATE LOAD (TONS)



COMPRESSION (S.F.=1.0)



TENSION (S.F.=1.0)

S-CASE
CH.CL- Φ=23°
ML- Φ=30°
SM.SP- Φ=30°, 33°

TYPICAL SOIL PROFILE

SOIL STRATIFICATION IS BASED ON GEOLOGIC PROFILE

SHEAR STRENGTH AND WET DENSITIES SEE PLATE 40

D	PILE SPACING IN DIRECTION OF LOADING
1.00	8B
0.85	7B
0.70	6B
0.55	5B
0.40	4B
0.25	3B
C	**LOADING CONDITION**
1.00	INITIAL LOADING
0.30	CYCLIC LOADING

NOTES: $K_H = \alpha K_1/B = (0.2222\,qu/B)(C)(D)$ COHESIVE

α = 0.4 = Factor of material properties of soil and pile

k_1 = Modulus of subgrade reaction for test plate (pci)

B_1 = Width or diameter of test plate (in)

$K_1 = k_1 B_1$ = 80 qu (psf) = 0.5556 qu (psi)

qu = 2·c = Unconfined compressive strength (psf)

C = Reduction for cyclic loading-not applicable

D = Group effect reduction factor

B = Width of pile measured at right angles to the direction of displacement (in)

$K_H = (nh)(Z/B)(C)(D)$ COHESIONLESS

nh = Coefficient of horizontal subgrade reaction (pci)

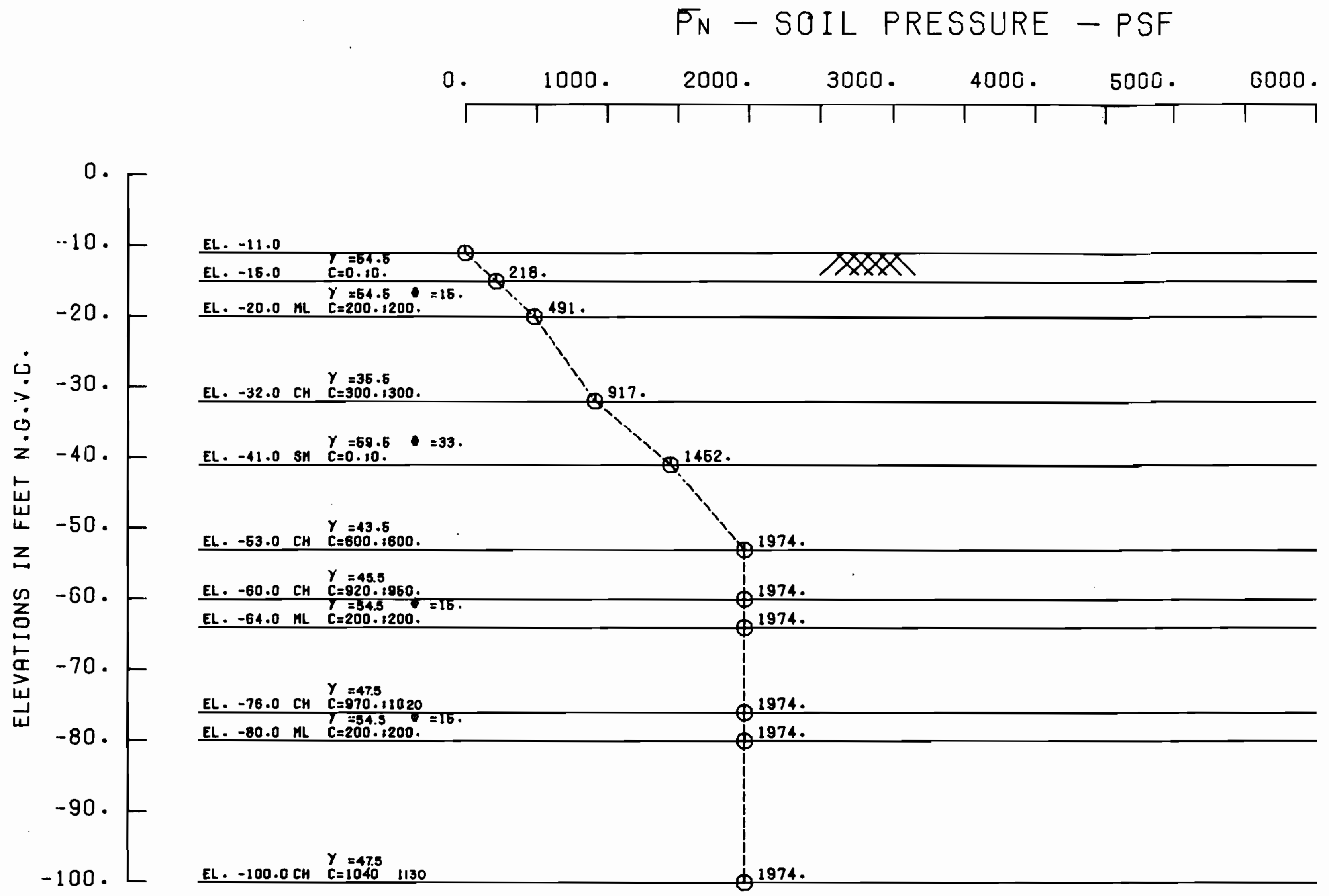
Z = Depth below equivalent ground surface (in)

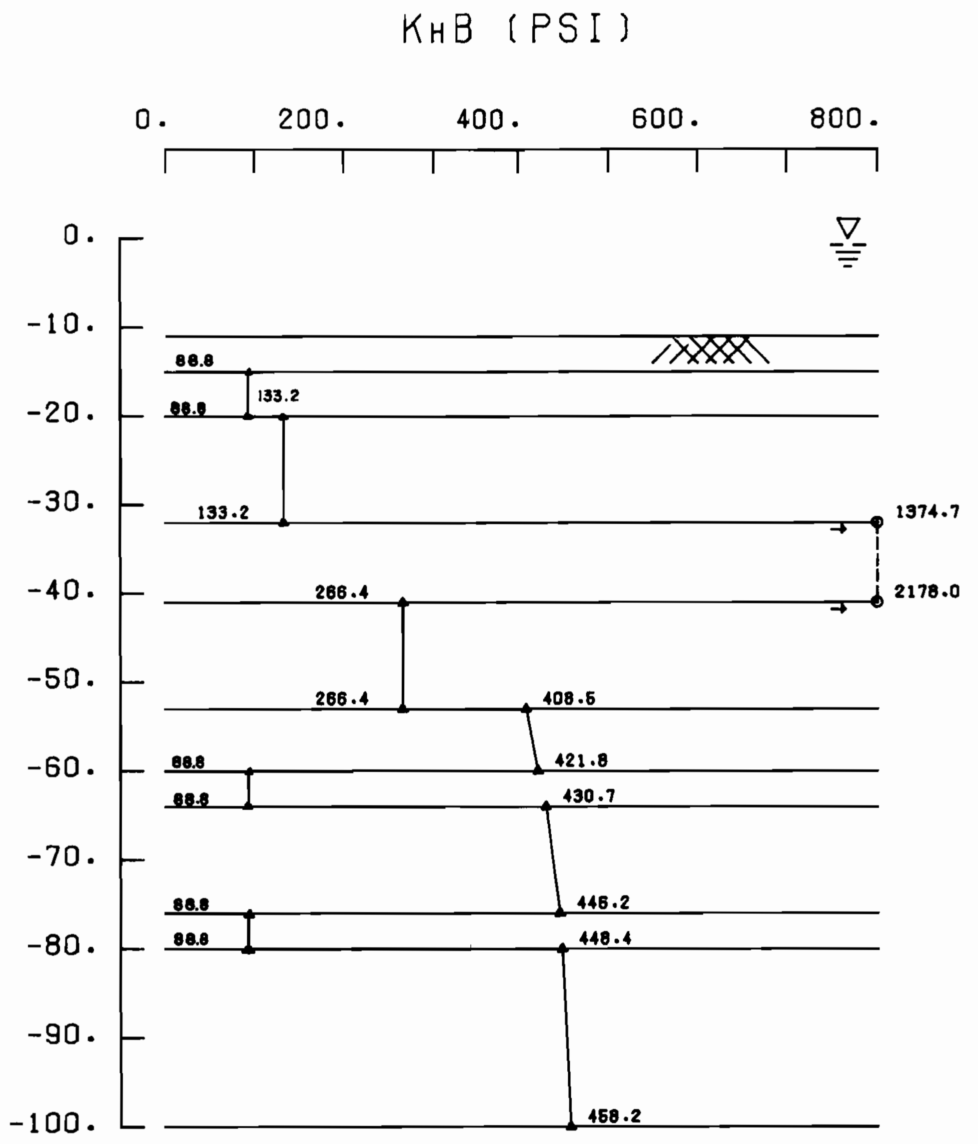
THE FACTOR SHOWN, (MODULUS OF HORIZONTAL SUBGRADE K_h, TIMES THE PILE WIDTH IN INCHES (B), MEASURED AT RIGHT ANGLES TO THE DIRECTION OF DISPLACEMENT; MUST BE MODIFIED BY A REDUCTION FACTOR FOR THE EFFECT OF GROUP ACTION (D) AND A REDUCTION FACTOR FOR CYCLIC LOADING (C) EX: $K_h = \frac{0.2222\,qu\,(C)(D)}{(B)}$

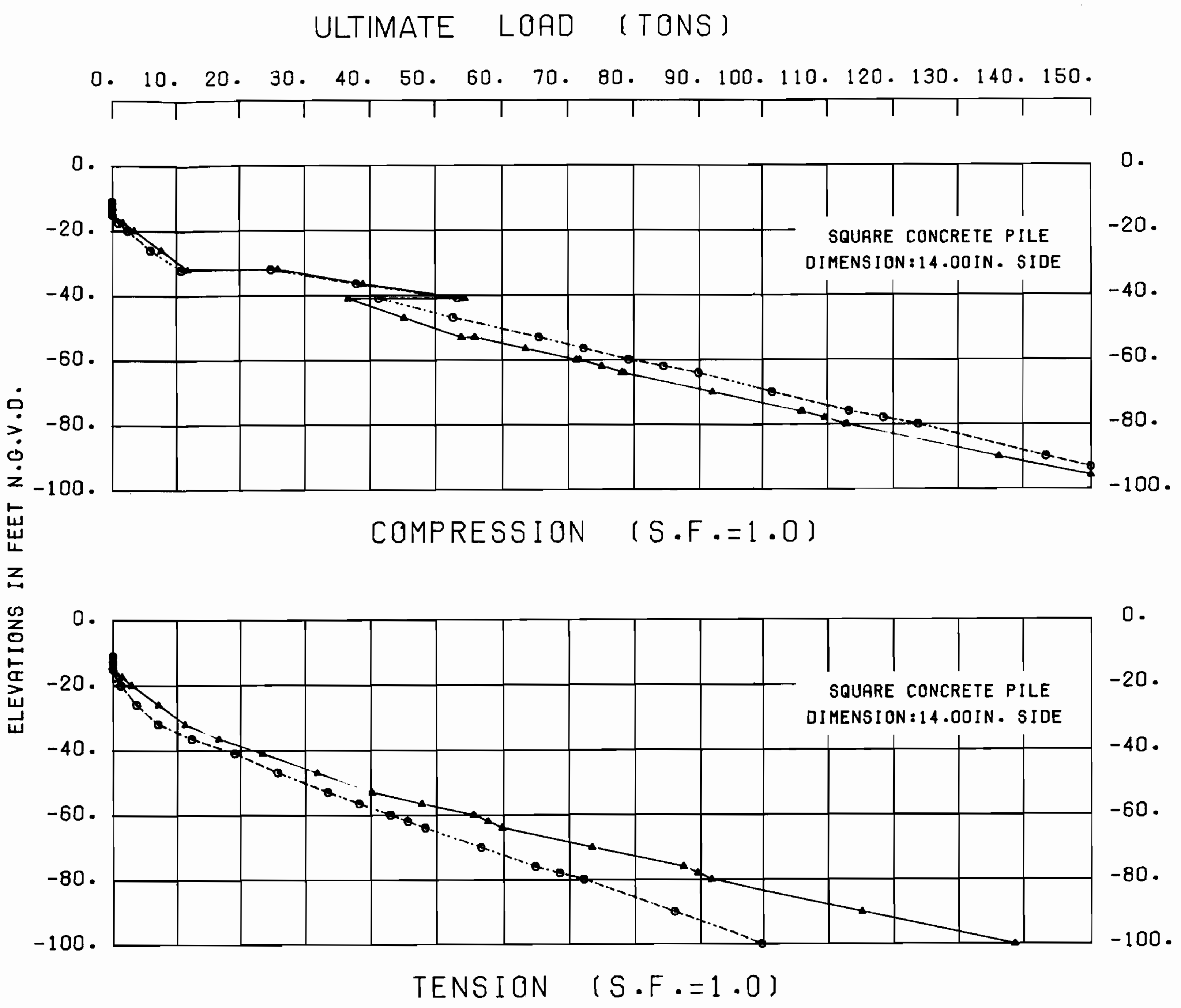
NOTE: ALLOWABLE CAPACITIES SHOULD BE DETERMINED INCORPORATING F.S.=2.0 WITH PILE TEST OR F.S. = 3.0 WITHOUT PILE TEST.

----- S-CASE
——— Q-CASE

LAKE PONTCHARTRAIN, LA AND VICINITY
HIGH LEVEL PLAN
DESIGN MEMORANDUM NO. 19 GENERAL DESIGN
ORLEANS AVENUE OUTFALL CANAL
VALVE STRUCTURE
TIMBER PILES
PILE CAPACITY CURVES
U.S. ARMY ENGINEER DISTRICT, NEW ORLEANS
CORPS OF ENGINEERS
JUNE, 1988 FILE NO. H-2-30290







S-CASE

CH,CL- Φ=23°

ML- Φ=30°

SM,SP- Φ=30°,33°

TYPICAL SOIL PROFILE

SOIL STRATIFICATION IS BASED ON GEOLOGIC PROFILE

SHEAR STRENGTH AND WET DENSITIES SEE PLATE 40

D	PILE SPACING IN DIRECTION OF LOADING
1.00	8B
0.85	7B
0.70	6B
0.55	5B
0.40	4B
0.25	3B

C	LOADING CONDITION
1.00	INITIAL LOADING
0.30	CYCLIC LOADING

NOTES: $K_H = \alpha K_1/B = (0.2222\, qu/B)(C)(D)$ COHESIVE

α = 0.4 = Factor of material properties of soil and pile

k_1 = Modulus of subgrade reaction for test plate (pci)

B_1 = Width or diameter of test plate (in)

$K_1 = k_1 B_1$ = 80 qu (psf) = 0.5556 qu (psi)

qu = 2·c = Unconfined compressive strength (psf)

C = Reduction for cyclic loading-not applicable

D = Group effect reduction factor

B = Width of pile measured at right angles to the direction of displacement (in)

$K_H = (nh)(Z/B)(C)(D)$ COHESIONLESS

nh = Coeficcient of horizontal subgrade reaction (pci)

Z = Depth below equivalent ground surface (in)

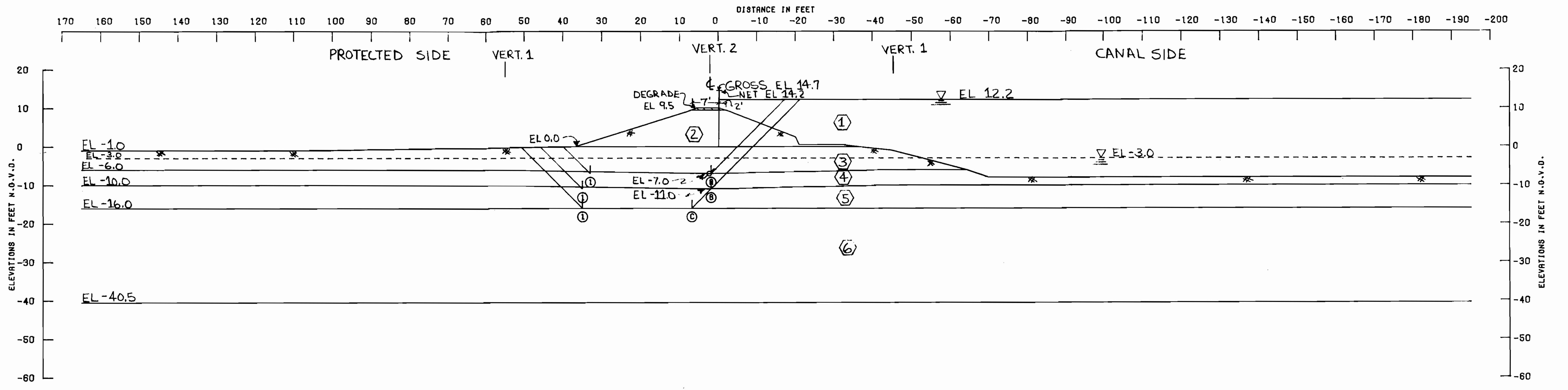
THE FACTOR SHOWN, (MODULUS OF HORIZONTAL SUBGRADE K_h, TIMES THE PILE WIDTH IN INCHES (B), MEASURED AT RIGHT ANGLES TO THE DIRECTION OF DISPLACEMENT) MUST BE MODIFIED BY A REDUCTION FACTOR FOR THE EFFECT OF GROUP ACTION (D) AND A REDUCTION FACTOR FOR CYCLIC LOADING (C) EX: $K_h = \frac{0.2222\, qu\,(C)(D)}{(B)}$

----- S-CASE

——— Q-CASE

NOTE: ALLOWABLE CAPACITIES SHOULD BE DETERMINED INCORPORATING F.S.=2.0 WITH PILE TEST OR F.S.=3.0 WITHOUT PILE TEST

LAKE PONTCHARTRAIN, LA. AND VICINITY
HIGH LEVEL PLAN
DESIGN MEMORANDUM NO. 19 GENERAL DESIGN
ORLEANS AVENUE OUTFALL CANAL
VALVE STRUCTURE
14" SQUARE PRESTRESSED CONCRETE PILES
PILE CAPACITY CURVES
U.S. ARMY ENGINEER DISTRICT, NEW ORLEANS
CORPS OF ENGINEERS
JUNE, 1988 FILE NO. H-2-30290



ASSUMED FAILURE SURFACE NO.		ASSUMED FAILURE SURFACE ELEV.	RESISTING FORCES R_A	RESISTING FORCES R_B	RESISTING FORCES R_P	DRIVING FORCES D_A	DRIVING FORCES $-D_P$	SUMMATION OF FORCES RESISTING	SUMMATION OF FORCES DRIVING	FACTOR OF SAFETY
A	1	-7.0	13883	11509	4706	16841	2744	30098	14097	2.14
B	1	-11.0	14512	8459	5967	24569	5872	28938	18697	1.55
C	1	-16.0	17959	8387	8272	36628	12150	34618	24478	1.41

STRATUM NO.	SOIL TYPE	EFFECTIVE UNIT WT. P.C.F. VERT. 1	EFFECTIVE UNIT WT. P.C.F. VERT. 2	C - UNIT COHESION - P.S.F. CENTER OF STRATUM VERT. 1	CENTER OF STRATUM VERT. 2	BOTTOM OF STRATUM VERT. 1	BOTTOM OF STRATUM VERT. 2	FRICTION ANGLE DEGREES
1	(WATER)	62.5	62.5	0.0	0.0	0.0	0.0	0.0
2	(CH)	115.0	115.0	700.0	700.0	700.0	700.0	0.0
3	(CH)	100.0	101.0	300.0	400.0	300.0	400.0	0.0
4	(CH)	75.0	90.0	150.0	300.0	150.0	300.0	0.0
5	(CH)	100.0	102.0	200.0	350.0	200.0	350.0	0.0
6	(SP)	122.0	122.0	0.0	0.0	0.0	0.0	33.0

GENERAL NOTES:

CLASSIFICATION, STRATIFICATION, SHEAR STRENGTH, AND UNIT WEIGHT OF THE SOIL WERE BASED ON THE RESULTS OF UNDISTURBED BORINGS. SEE BORING DATA PLATE 39

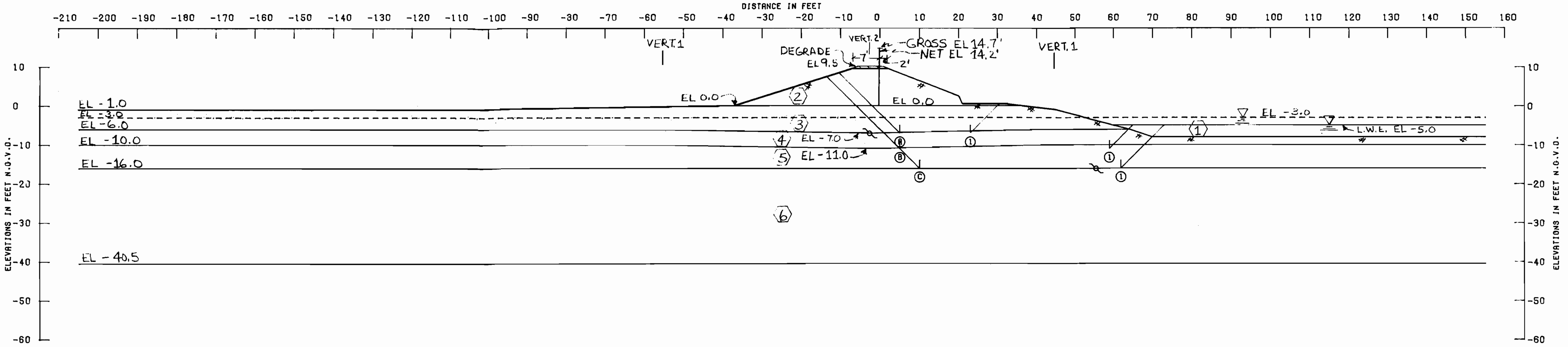
NOTES

ϕ -- ANGLE OF INTERNAL FRICTION, DEGREES
C -- UNIT COHESION, P.S.F.
∇ -- STATIC WATER SURFACE
D -- HORIZONTAL DRIVING FORCE IN POUNDS
R -- HORIZONTAL RESISTING FORCE IN POUNDS
A -- AS A SUBSCRIPT, REFERS TO ACTIVE WEDGE
B -- AS A SUBSCRIPT, REFERS TO CENTRAL BLOCK
P -- AS A SUBSCRIPT, REFERS TO PASSIVE WEDGE

$$\text{FACTOR OF SAFETY} = \frac{R_A + R_B + R_P}{D_A - D_P}$$

LAKE PONTCHARTRAIN, LA. AND VICINITY
HIGH LEVEE PLAN
DESIGN MEMORANDUM NO. 19 — GENERAL DESIGN
ORLEANS AVENUE OUTFALL CANAL
PROTECTED SIDE LEVEE STABILITY ANALYSIS STA. 0+00 TO 36+50 EAST SIDE
U.S. ARMY ENGINEER DISTRICT, NEW ORLEANS
CORPS OF ENGINEERS

JUNE 1988 FILE NO. H-2-30290



ASSUMED FAILURE SURFACE NO.		ASSUMED FAILURE SURFACE ELEV.	RESISTING FORCES R_A	R_B	R_P	DRIVING FORCES D_A	$-D_P$	SUMMATION OF FORCES RESISTING	DRIVING	FACTOR OF SAFETY
A	1	-7.0	17266	6568	5435	14825	2876	29269	11949	2.45
B	1	-11.0	18281	10590	1499	22003	1407	30370	20596	1.47
C	1	-16.0	21478	11953	3000	32765	4775	36431	27990	1.30

STRATUM NO:	SOIL TYPE	EFFECTIVE UNIT WT. P.C.F. VERT. 1	VERT. 2	C - UNIT COHESION - P.S.F. CENTER OF STRATUM VERT. 1	VERT. 2	BOTTOM OF STRATUM VERT. 1	VERT. 2	FRICTION ANGLE DEGREES
1	(WATER)	62.5	62.5	0.0	0.0	0.0	0.0	0.0
2	(CH)	115.0	115.0	700.0	700.0	700.0	700.0	0.0
3	(CH)	100.0	101.0	300.0	400.0	300.0	400.0	0.0
4	(CH)	75.0	90.0	150.0	300.0	150.0	300.0	0.0
5	(CH)	100.0	102.0	200.0	350.0	200.0	350.0	0.0
6	(SP)	122.0	122.0	0.0	0.0	0.0	0.0	33.0

GENERAL NOTES:

CLASSIFICATION, STRATIFICATION, SHEAR STRENGTH, AND UNIT WEIGHT OF THE SOIL WERE BASED ON THE RESULTS OF UNDISTURBED BORINGS. SEE BORING DATA PLATE 39

NOTES

- Φ -- ANGLE OF INTERNAL FRICTION, DEGREES
- C -- UNIT COHESION, P.S.F.
- $\underline{\nabla}$ -- STATIC WATER SURFACE
- D -- HORIZONTAL DRIVING FORCE IN POUNDS
- R -- HORIZONTAL RESISTING FORCE IN POUNDS
- A -- AS A SUBSCRIPT, REFERS TO ACTIVE WEDGE
- B -- AS A SUBSCRIPT, REFERS TO CENTRAL BLOCK
- P -- AS A SUBSCRIPT, REFERS TO PASSIVE WEDGE

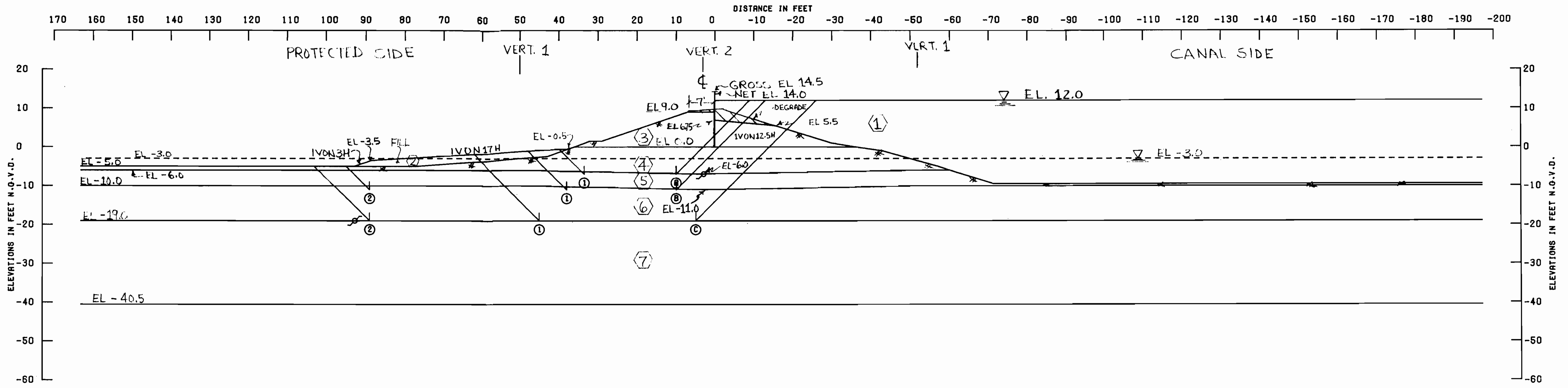
$$\text{FACTOR OF SAFETY} = \frac{R_A + R_B + R_P}{D_A - D_P}$$

LAKE PONTCHARTRAIN, LA. AND VICINITY
HIGH LEVEL PLAN
DESIGN MEMORANDUM NO. 19 - GENERAL DESIGN
ORLEANS AVENUE OUTFALL CANAL

FLOOD SIDE LEVEE
STABILITY ANALYSIS
STA. 0+00 TO 36+50 EAST SIDE

U.S. ARMY ENGINEER DISTRICT, NEW ORLEANS
CORPS OF ENGINEERS

JUNE 1988 FILE NO. H-2-30290



ASSUMED FAILURE SURFACE NO.		ASSUMED FAILURE SURFACE ELEV.	RESISTING FORCES R_A	RESISTING FORCES R_B	RESISTING FORCES R_P	DRIVING FORCES D_A	DRIVING FORCES $-D_P$	SUMMATION OF FORCES RESISTING	SUMMATION OF FORCES DRIVING	FACTOR OF SAFETY
A	1	-7.0	14656	8462	4259	15036	2404	27377	12632	2.17
B	1	-11.0	16557	6523	5180	22905	5045	28260	17860	1.58
B	2	-11.0	16557	14403	2100	22905	1780	33060	21125	1.56
C	1	-19.0	19340	11191	7626	43248	14600	38157	28648	1.33
C	2	-19.0	19340	20031	5400	43248	8992	44771	34256	1.31

STRATUM NO.	SOIL TYPE	EFFECTIVE UNIT WT. P.C.F. VERT. 1	EFFECTIVE UNIT WT. P.C.F. VERT. 2	C - UNIT COHESION - P.S.F. CENTER OF STRATUM VERT. 1	C - UNIT COHESION - P.S.F. CENTER OF STRATUM VERT. 2	C - UNIT COHESION - P.S.F. BOTTOM OF STRATUM VERT. 1	C - UNIT COHESION - P.S.F. BOTTOM OF STRATUM VERT. 2	FRICTION ANGLE DEGREES
1	(WATER)	62.5	62.5	0.0	0.0	0.0	0.0	0.0
2	(CH)	110.0	110.0	400.0	400.0	400.0	400.0	0.0
3	(CH)	115.0	115.0	700.0	700.0	700.0	700.0	0.0
4	(CH)	100.0	101.0	300.0	400.0	300.0	400.0	0.0
5	(CH)	75.0	90.0	150.0	300.0	150.0	300.0	0.0
6	(CH)	100.0	102.0	200.0	350.0	200.0	350.0	0.0
7	(SP)	122.0	122.0	0.0	0.0	0.0	0.0	33.0

GENERAL NOTES:

CLASSIFICATION, STRATIFICATION, SHEAR STRENGTH, AND UNIT WEIGHT OF THE SOIL WERE BASED ON THE RESULTS OF UNDISTURBED BORINGS. SEE BORING DATA PLATE 39

NOTES

- ϕ -- ANGLE OF INTERNAL FRICTION, DEGREES
- C -- UNIT COHESION, P.S.F.
- ∇ -- STATIC WATER SURFACE
- D -- HORIZONTAL DRIVING FORCE IN POUNDS
- R -- HORIZONTAL RESISTING FORCE IN POUNDS
- A -- AS A SUBSCRIPT, REFERS TO ACTIVE WEDGE
- B -- AS A SUBSCRIPT, REFERS TO CENTRAL BLOCK
- P -- AS A SUBSCRIPT, REFERS TO PASSIVE WEDGE

$$\text{FACTOR OF SAFETY} = \frac{R_A + R_B + R_P}{D_A - D_P}$$

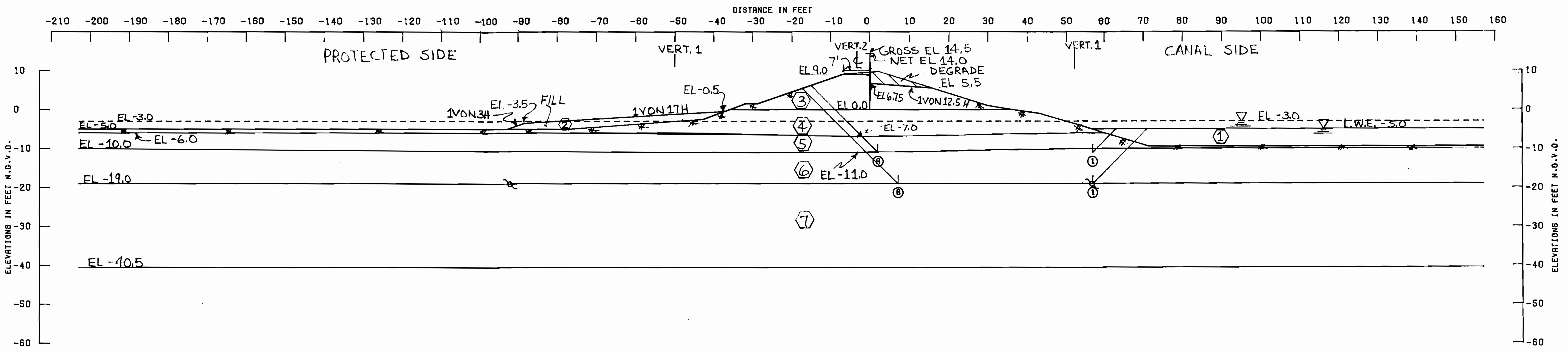
LAKE PONTCHARTRAIN, LA. AND VICINITY
HIGH LEVEE PLAN
DESIGN MEMORANDUM NO. 19 - GENERAL DESIGN
ORLEANS AVENUE OUTFALL CANAL

PROTECTED SIDE LEVEE
STABILITY ANALYSIS
STA. 36+50 TO 50+00 EAST SIDE

U.S. ARMY ENGINEER DISTRICT, NEW ORLEANS
CORPS OF ENGINEERS

JUNE 1988 FILE NO. H-2-30290

PLATE 50



ASSUMED FAILURE SURFACE		RESISTING FORCES			DRIVING FORCES		SUMMATION OF FORCES		FACTOR OF SAFETY
NO.	ELEV.	R_A	R_B	R_P	D_A	$-D_P$	RESISTING	DRIVING	
Ⓐ ①	-11.0	16542	11659	1359	19726	1331	29560	18395	1.61
Ⓑ ①	-19.0	20787	12760	4100	37153	8104	37647	29049	1.30

STRATUM NO.	SOIL TYPE	EFFECTIVE UNIT WT. P.C.F.		C - UNIT COHESION - P.S.F.				FRICTION ANGLE DEGREES
				CENTER OF STRATUM		BOTTOM OF STRATUM		
		VERT. 1	VERT. 2	VERT. 1	VERT. 2	VERT. 1	VERT. 2	
1	(WATER)	62.5	62.5	0.0	0.0	0.0	0.0	0.0
2	(CH)	110.0	110.0	400.0	400.0	400.0	400.0	0.0
3	(CH)	115.0	115.0	700.0	700.0	700.0	700.0	0.0
4	(CH)	100.0	101.0	300.0	400.0	300.0	400.0	0.0
5	(CH)	75.0	90.0	150.0	300.0	150.0	300.0	0.0
6	(CH)	100.0	102.0	200.0	350.0	200.0	350.0	0.0
7	(SP)	122.0	122.0	0.0	0.0	0.0	0.0	33.0

GENERAL NOTES:

CLASSIFICATION, STRATIFICATION, SHEAR STRENGTH, AND UNIT WEIGHT OF THE SOIL WERE BASED ON THE RESULTS OF UNDISTURBED BORINGS. SEE BORING DATA PLATE 39

NOTES

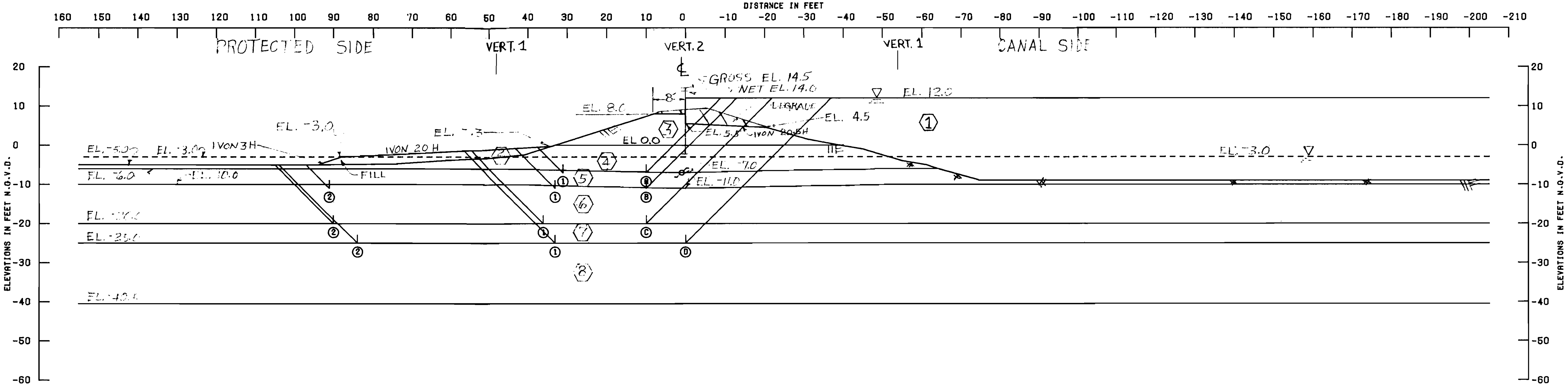
- ϕ -- ANGLE OF INTERNAL FRICTION, DEGREES
- C -- UNIT COHESION, P.S.F.
- ∇ -- STATIC WATER SURFACE
- D -- HORIZONTAL DRIVING FORCE IN POUNDS
- R -- HORIZONTAL RESISTING FORCE IN POUNDS
- A -- AS A SUBSCRIPT, REFERS TO ACTIVE WEDGE
- B -- AS A SUBSCRIPT, REFERS TO CENTRAL BLOCK
- P -- AS A SUBSCRIPT, REFERS TO PASSIVE WEDGE

$$\text{FACTOR OF SAFETY} = \frac{R_A + R_B + R_P}{D_A - D_P}$$

LAKE PONTCHARTRAIN, LA. AND VICINITY
HIGH LEVEE PLAN
DESIGN MEMORANDUM NO. 19 - GENERAL DESIGN
ORLEANS AVENUE OUTFALL CANAL
FLOOD SIDE LEVEE
STABILITY ANALYSIS
STA. 36+50 TO 50+00 EAST SIDE
U.S. ARMY ENGINEER DISTRICT, NEW ORLEANS
CORPS OF ENGINEERS

JUNE 1988 FILE NO. H-2-30290

PLATE: 51



ASSUMED FAILURE SURFACE NO.		ASSUMED FAILURE SURFACE ELEV.	RESISTING FORCES R_A	R_B	R_P	DRIVING FORCES D_A	$-D_P$	SUMMATION OF FORCES RESISTING	DRIVING	FACTOR OF SAFETY
A	1	-7.0	12974	7529	4405	13766	2379	24908	11387	2.19
B	1	-11.0	15032	5395	5579	21397	5379	26006	16018	1.62
B	2	-11.0	15032	14454	2100	21397	1652	31586	19745	1.60
C	1	-20.0	20483	7274	8846	44192	17519	36603	26673	1.37
C	2	-20.0	20483	18304	5800	44192	10342	44587	33850	1.32
D	1	-25.0	19757	11005	11803	60470	28040	42565	32430	1.31
D	2	-25.0	19757	26424	8800	60470	19876	54981	40594	1.35

STRATUM NO.	SOIL TYPE	EFFECTIVE UNIT WT. P.C.F. VERT. 1	VERT. 2	C - UNIT COHESION - P.S.F. CENTER OF STRATUM VERT. 1	VERT. 2	BOTTOM OF STRATUM VERT. 1	VERT. 2	FRICTION ANGLE DEGREES
1	(WATER)	62.5	62.5	0.0	0.0	0.0	0.0	0.0
2	(CH)	110.0	110.0	400.0	400.0	400.0	400.0	0.0
3	(CH)	115.0	115.0	700.0	700.0	700.0	700.0	0.0
4	(CH)	100.0	101.0	300.0	400.0	300.0	400.0	0.0
5	(CH)	75.0	90.0	150.0	300.0	150.0	300.0	0.0
6	(CH)	100.0	102.0	200.0	350.0	200.0	350.0	0.0
7	(CH)	100.0	102.0	300.0	350.0	300.0	350.0	0.0
8	(SP)	122.0	122.0	0.0	0.0	0.0	0.0	33.0

GENERAL NOTES:

CLASSIFICATION, STRATIFICATION, SHEAR STRENGTH, AND UNIT WEIGHT OF THE SOIL WERE BASED ON THE RESULTS OF UNDISTURBED BORINGS. SEE BORING DATA PLATE 39

NOTES

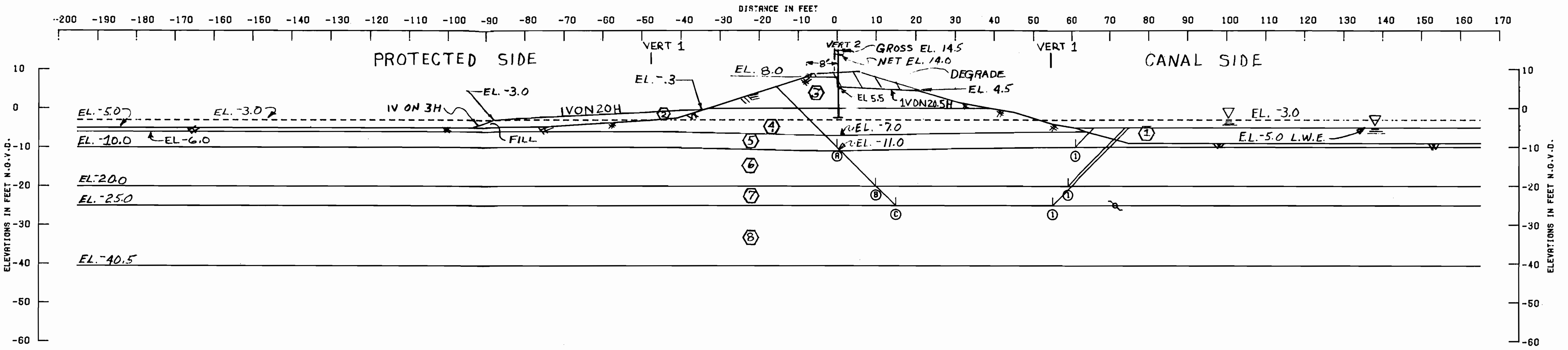
Φ -- ANGLE OF INTERNAL FRICTION, DEGREES
C -- UNIT COHESION, P.S.F.
∇ -- STATIC WATER SURFACE
D -- HORIZONTAL DRIVING FORCE IN POUNDS
R -- HORIZONTAL RESISTING FORCE IN POUNDS
A -- AS A SUBSCRIPT, REFERS TO ACTIVE WEDGE
B -- AS A SUBSCRIPT, REFERS TO CENTRAL BLOCK
P -- AS A SUBSCRIPT, REFERS TO PASSIVE WEDGE

$$\text{FACTOR OF SAFETY} = \frac{R_A + R_B + R_P}{D_A - D_P}$$

LAKE PONTCHARTRAIN, LA. AND VICINITY
HIGH LEVEE PLAN
DESIGN MEMORANDUM NO.19 - GENERAL DESIGN
ORLEANS AVENUE OUTFALL CANAL
PROTECTED SIDE LEVEE
STABILITY ANALYSIS
STA. 50+00 TO 64+00 EAST SIDE
U.S. ARMY ENGINEER DISTRICT, NEW ORLEANS
CORPS OF ENGINEERS

JUNE 1988 FILE NO. H-2-30290

PLATE: 52



ASSUMED FAILURE SURFACE		RESISTING FORCES			DRIVING FORCES		SUMMATION OF FORCES		FACTOR OF SAFETY
NO.	ELEV.	R_A	R_B	R_P	D_A	$-D_P$	RESISTING	DRIVING	
A 1	-10.0	11682	13126	1135	15973	936	25943	15037	1.73
B 1	-20.0	18276	12440	4621	36446	9562	35337	26884	1.31
C 1	-25.0	21653	12691	7557	50226	18015	41901	32211	1.30

STRATUM NO.	SOIL TYPE	EFFECTIVE UNIT WT. P.C.F.		C - UNIT COHESION - P.S.F.				FRICTION ANGLE DEGREES
				CENTER OF STRATUM		BOTTOM OF STRATUM		
		VERT. 1	VERT. 2	VERT. 1	VERT. 2	VERT. 1	VERT. 2	
1	(WATER)	62.5	62.5	0.0	0.0	0.0	0.0	0.0
2	(CH)	110.0	110.0	400.0	400.0	400.0	400.0	0.0
3	(CH)	115.0	115.0	700.0	700.0	700.0	700.0	0.0
4	(CH)	100.0	101.0	300.0	400.0	300.0	400.0	0.0
5	(CH)	75.0	90.0	150.0	300.0	150.0	300.0	0.0
6	(CH)	100.0	102.0	200.0	350.0	200.0	350.0	0.0
7	(CH)	100.0	102.0	300.0	350.0	300.0	350.0	0.0
8	(SP)	122.0	122.0	0.0	0.0	0.0	0.0	33.0

GENERAL NOTES:

CLASSIFICATION, STRATIFICATION, SHEAR STRENGTH, AND UNIT WEIGHT OF THE SOIL WERE BASED ON THE RESULTS OF UNDISTURBED BORINGS. SEE BORING DATA PLATE 39

NOTES

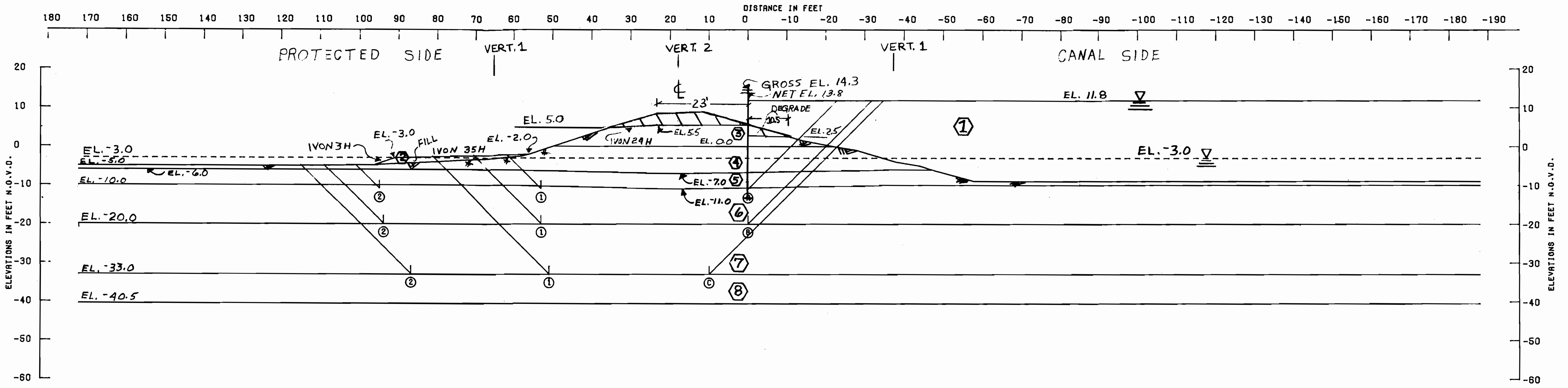
Φ --- ANGLE OF INTERNAL FRICTION, DEGREES
C --- UNIT COHESION, P.S.F.
▽ --- STATIC WATER SURFACE
D --- HORIZONTAL DRIVING FORCE IN POUNDS
R --- HORIZONTAL RESISTING FORCE IN POUNDS
A --- AS A SUBSCRIPT, REFERS TO ACTIVE WEDGE
B --- AS A SUBSCRIPT, REFERS TO CENTRAL BLOCK
P --- AS A SUBSCRIPT, REFERS TO PASSIVE WEDGE

$$\text{FACTOR OF SAFETY} = \frac{R_A + R_B + R_P}{D_A - D_P}$$

LAKE PONTCHARTRAIN, LA. AND VICINITY
HIGH LEVEE PLAN
DESIGN MEMORANDUM NO.19 - GENERAL DESIGN
ORLEANS AVENUE OUTFALL CANAL
FLOOD SIDE LEVEE
STABILITY ANALYSIS
STA. 50+00 TO 64+00 EAST SIDE
U.S. ARMY ENGINEER DISTRICT, NEW ORLEANS
CORPS OF ENGINEERS

JUNE 1988 FILE NO. H-2-30290

PLATE: 53



ASSUMED FAILURE SURFACE		RESISTING FORCES			DRIVING FORCES		SUMMATION OF FORCES		FACTOR OF SAFETY
NO.	ELEV.	R_A	R_B	R_P	D_A	$-D_P$	RESISTING	DRIVING	
A 1	-11.0	9385	13503	4341	20033	3926	27229	16107	1.69
A 2	-11.0	9385	20033	2184	20033	1630	31602	18403	1.72
B 1	-20.0	12032	16153	7980	40573	15042	36165	25531	1.42
B 2	-20.0	12032	24583	5823	40573	10352	42438	30221	1.40
C 1	-33.0	19952	13742	15430	83217	45442	49124	37775	1.30
C 2	-33.0	19952	24646	13600	83217	38370	58198	44847	1.30

STRATUM NO.	SOIL TYPE	EFFECTIVE UNIT WT. P.C.F.		C - UNIT COHESION -- P.S.F.				FRICTION ANGLE DEGREES
				CENTER OF STRATUM		BOTTOM OF STRATUM		
		VERT. 1	VERT. 2	VERT. 1	VERT. 2	VERT. 1	VERT. 2	
1	(WATER)	62.5	62.5	0.0	0.0	0.0	0.0	0.0
2	(CH)	110.0	110.0	400.0	400.0	400.0	400.0	0.0
3	(CH)	115.0	115.0	700.0	700.0	700.0	700.0	0.0
4	(CH)	100.0	101.0	300.0	400.0	300.0	400.0	0.0
5	(CH)	75.0	90.0	150.0	300.0	150.0	300.0	0.0
6	(CH)	100.0	102.0	200.0	350.0	200.0	350.0	0.0
7	(CH)	100.0	102.0	300.0	350.0	300.0	350.0	0.0
8	(SP)	122.0	122.0	0.0	0.0	0.0	0.0	33.0

GENERAL NOTES:

CLASSIFICATION, STRATIFICATION, SHEAR STRENGTH, AND UNIT WEIGHT OF THE SOIL WERE BASED ON THE RESULTS OF UNDISTURBED BORINGS. SEE BORING DATA PLATE 39

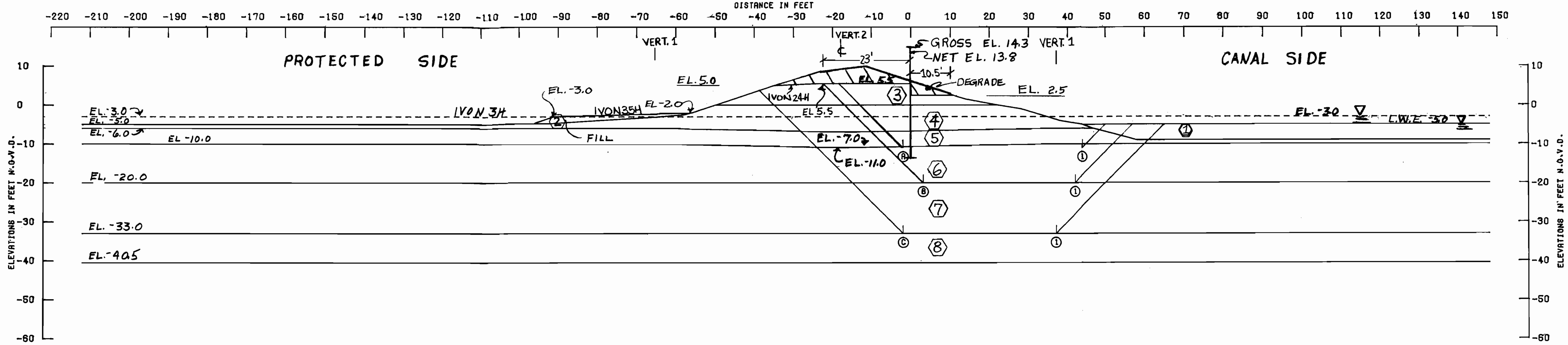
NOTES

Φ -- ANGLE OF INTERNAL FRICTION, DEGREES
C -- UNIT COHESION, P.S.F.
▽ -- STATIC WATER SURFACE
D -- HORIZONTAL DRIVING FORCE IN POUNDS
R -- HORIZONTAL RESISTING FORCE IN POUNDS
A -- AS A SUBSCRIPT, REFERS TO ACTIVE WEDGE
B -- AS A SUBSCRIPT, REFERS TO CENTRAL BLOCK
P -- AS A SUBSCRIPT, REFERS TO PASSIVE WEDGE

$$\text{FACTOR OF SAFETY} = \frac{R_A + R_B + R_P}{D_A - D_P}$$

LAKE PONTCHARTRAIN, LA. AND VICINITY
HIGH LEVEE PLAN
DESIGN MEMORANDUM NO. 19 - GENERAL DESIGN
ORLEANS AVENUE OUTFALL CANAL
PROTECTED SIDE LEVEE
STABILITY ANALYSIS
STA. 64+00 TO 90+50 EAST SIDE
U.S. ARMY ENGINEER DISTRICT, NEW ORLEANS
CORPS OF ENGINEERS

JUNE 1988 FILE NO. H-2-30290



ASSUMED FAILURE SURFACE		RESISTING FORCES			DRIVING FORCES		SUMMATION OF FORCES		FACTOR OF SAFETY
NO.	ELEV.	R_A	R_B	R_P	D_A	$-D_P$	RESISTING	DRIVING	
A 1	-11.0	11831	8974	1371	14277	1332.	22176	12945	1.71
B 1	-20.0	17548	9376	4621	32291	9562	31545	22729	1.39
C 1	-33.0	25449	12391	12100	74585	36025	49940	38560	1.30

STRATUM NO.	SOIL TYPE	EFFECTIVE UNIT WT. P.C.F.		C - UNIT COHESION - P.S.F.				FRICTION ANGLE DEGREES
				CENTER OF STRATUM		BOTTOM OF STRATUM		
		VERT. 1	VERT. 2	VERT. 1	VERT. 2	VERT. 1	VERT. 2	
1	(WATER)	62.5	62.5	0.0	0.0	0.0	0.0	0.0
2	(CH)	110.0	110.0	400.0	400.0	400.0	400.0	0.0
3	(CH)	115.0	115.0	700.0	700.0	700.0	700.0	0.0
4	(CH)	100.0	101.0	300.0	400.0	300.0	400.0	0.0
5	(CH)	75.0	90.0	150.0	300.0	150.0	300.0	0.0
6	(CH)	100.0	102.0	200.0	350.0	200.0	350.0	0.0
7	(CH)	100.0	102.0	300.0	350.0	300.0	350.0	0.0
8	(SP)	122.0	122.0	0.0	0.0	0.0	0.0	33.0

GENERAL NOTES:

CLASSIFICATION, STRATIFICATION, SHEAR STRENGTH, AND UNIT WEIGHT OF THE SOIL WERE BASED ON THE RESULTS OF UNDISTURBED BORINGS. SEE BORING DATA PLATE 39

NOTES

- ϕ -- ANGLE OF INTERNAL FRICTION, DEGREES
- C -- UNIT COHESION, P.S.F.
- ∇ -- STATIC WATER SURFACE
- D -- HORIZONTAL DRIVING FORCE IN POUNDS
- R -- HORIZONTAL RESISTING FORCE IN POUNDS
- A -- AS A SUBSCRIPT, REFERS TO ACTIVE WEDGE
- B -- AS A SUBSCRIPT, REFERS TO CENTRAL BLOCK
- P -- AS A SUBSCRIPT, REFERS TO PASSIVE WEDGE

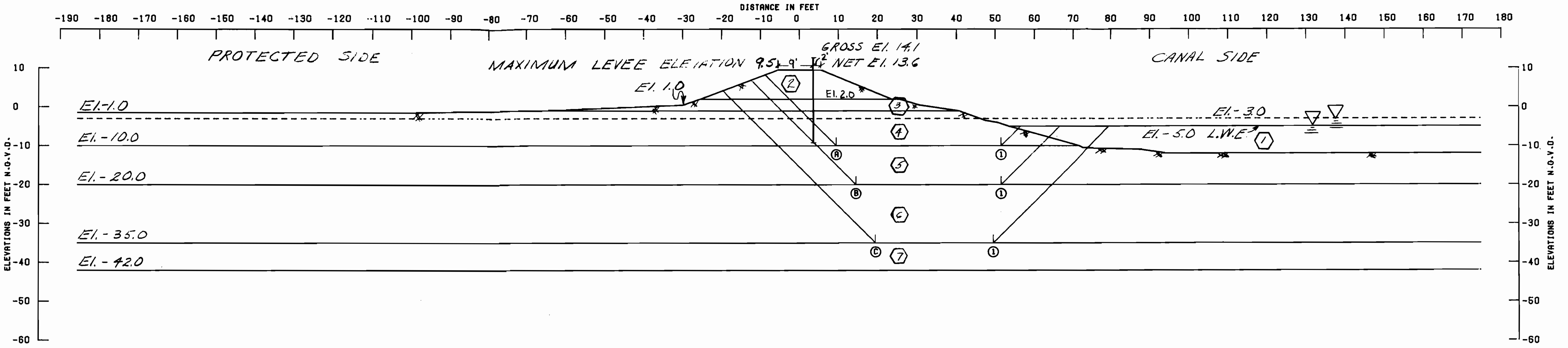
$$\text{FACTOR OF SAFETY} = \frac{R_A + R_B + R_P}{D_A - D_P}$$

LAKE PONTCHARTRAIN, LA. AND VICINITY
HIGH LEVEE PLAN
DESIGN MEMORANDUM NO. 19 - GENERAL DESIGN
ORLEANS AVENUE OUTFALL CANAL

FLOOD SIDE LEVEE STABILITY ANALYSIS STA. 64+00 TO 90+50 EAST SIDE

U.S. ARMY ENGINEER DISTRICT, NEW ORLEANS
CORPS OF ENGINEERS

JUNE 1988 FILE NO. H-2-30290



NOTE: FLOODWALL TIP ELEVATION VARIES

STRATUM NO.	SOIL TYPE	EFFECTIVE UNIT WT. P.C.F.		C - UNIT COHESION - P.S.F.				FRICTION ANGLE DEGREES
				CENTER OF STRATUM		BOTTOM OF STRATUM		
		VERT. 1	VERT. 2	VERT. 1	VERT. 2	VERT. 1	VERT. 2	
1	(WATER)	62.5	62.5	0.0	0.0	0.0	0.0	0.0
2	(CH)	115.0	115.0	700.0	700.0	700.0	700.0	0.0
3	(CH)	112.0	112.0	600.0	600.0	600.0	600.0	0.0
4	(CH)	103.0	103.0	280.0	280.0	280.0	280.0	0.0
5	(CH)	103.0	103.0	350.0	350.0	350.0	350.0	0.0
6	(CH)	102.0	102.0	500.0	500.0	500.0	500.0	0.0
7	(SP)	122.0	122.0	0.0	0.0	0.0	0.0	33.0

ASSUMED FAILURE SURFACE			RESISTING FORCES			DRIVING FORCES		SUMMATION OF FORCES		FACTOR OF SAFETY
NO.		ELEV.	R_A	R_B	R_P	D_A	$-D_P$	RESISTING	DRIVING	
A	1	-10.0	17423	11760	2434	20580	1316	31617	19264	1.64
B	1	-20.0	22514	12950	8216	44328	10910	43680	33418	1.31
C	1	-35.0	33697	15000	21616	95832	43516	70313	52316	1.34

GENERAL NOTES:

CLASSIFICATION, STRATIFICATION, SHEAR STRENGTH, AND UNIT WEIGHT OF THE SOIL WERE BASED ON THE RESULTS OF UNDISTURBED BORINGS. SEE BORING DATA PLATE 40

NOTES

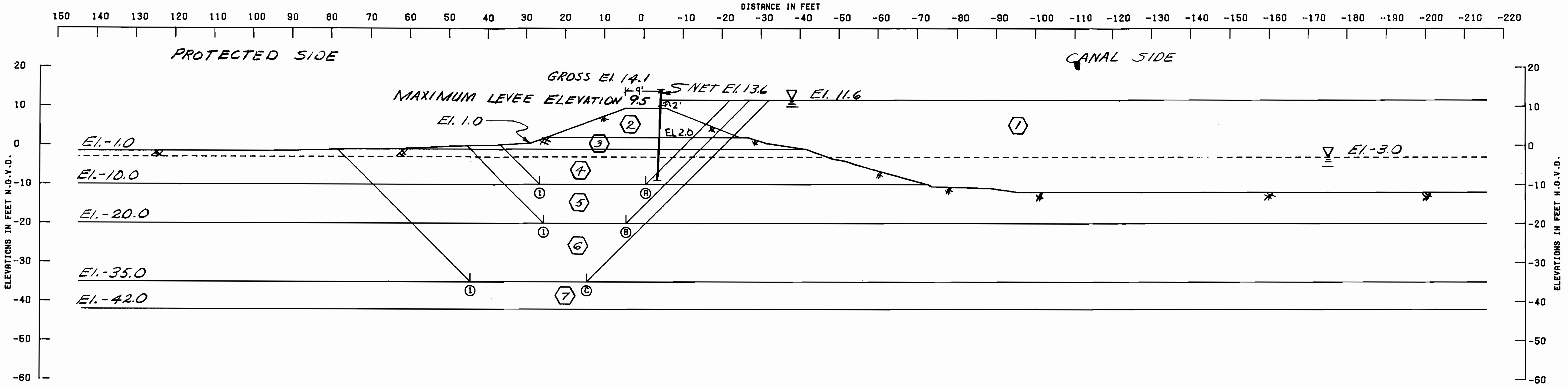
ϕ -- ANGLE OF INTERNAL FRICTION, DEGREES
C -- UNIT COHESION, P.S.F.
∇ -- STATIC WATER SURFACE
D -- HORIZONTAL DRIVING FORCE IN POUNDS
R -- HORIZONTAL RESISTING FORCE IN POUNDS
A -- AS A SUBSCRIPT, REFERS TO ACTIVE WEDGE
B -- AS A SUBSCRIPT, REFERS TO CENTRAL BLOCK
P -- AS A SUBSCRIPT, REFERS TO PASSIVE WEDGE

$$\text{FACTOR OF SAFETY} = \frac{R_A + R_B + R_P}{D_A - D_P}$$

LAKE PONTCHARTRAIN, LA. AND VICINITY
HIGH LEVEL PLAN
DESIGN MEMORANDUM NO. 19 GENERAL DESIGN
ORLEANS AVENUE OUTFALL CANAL

FLOODSIDE LEVEE STABILITY ANALYSIS STA. 90 + 50 TO STA. 104 + 00

U.S. ARMY ENGINEER DISTRICT, NEW ORLEANS
CORPS OF ENGINEERS
JUNE, 1988 FILE NO. H-2-30290



NOTE: FLOODWALL TIP ELEVATION VARIES

STRATUM NO.	SOIL TYPE	EFFECTIVE UNIT WT. P.C.F.		C - UNIT COHESION - P.S.F.				FRICTION ANGLE DEGREES
				CENTER OF STRATUM		BOTTOM OF STRATUM		
		VERT. 1	VERT. 2	VERT. 1	VERT. 2	VERT. 1	VERT. 2	
1	(WATER)	62.5	62.5	0.0	0.0	0.0	0.0	0.0
2	(CH)	115.0	115.0	700.0	70C.0	700.0	700.0	0.0
3	(CH)	112.0	112.0	6CC.0	60C.0	600.0	60C.0	0.0
4	(CH)	103.0	103.0	280.0	280.0	280.0	280.0	0.0
5	(CH)	103.0	103.0	350.0	350.0	350.0	350.0	0.0
6	(CH)	102.0	102.0	500.0	500.0	500.0	500.0	0.0
7	(SP)	122.0	122.0	0.0	0.0	0.0	0.0	33.0

ASSUMED FAILURE SURFACE		RESISTING FORCES			DRIVING FORCES		SUMMATION OF FORCES		FACTOR OF SAFETY
NO.	ELEV.	R_A	R_B	R_P	D_A	$-D_P$	RESISTING	DRIVING	
A 1	-10.0	13397	7560	6461	21911	5796	27418	16115	1.70
B 1	-20.0	18416	7350	13034	47708	21522	38800	2618C	1.48
C 1	-35.0	31436	15000	26988	103421	60415	73424	43006	1.71

GENERAL NOTES:

CLASSIFICATION, STRATIFICATION, SHEAR STRENGTH, AND UNIT WEIGHT OF THE SOIL WERE BASED ON THE RESULTS OF UNDISTURBED BORINGS. SEE BORING DATA PLATE 40

NOTES

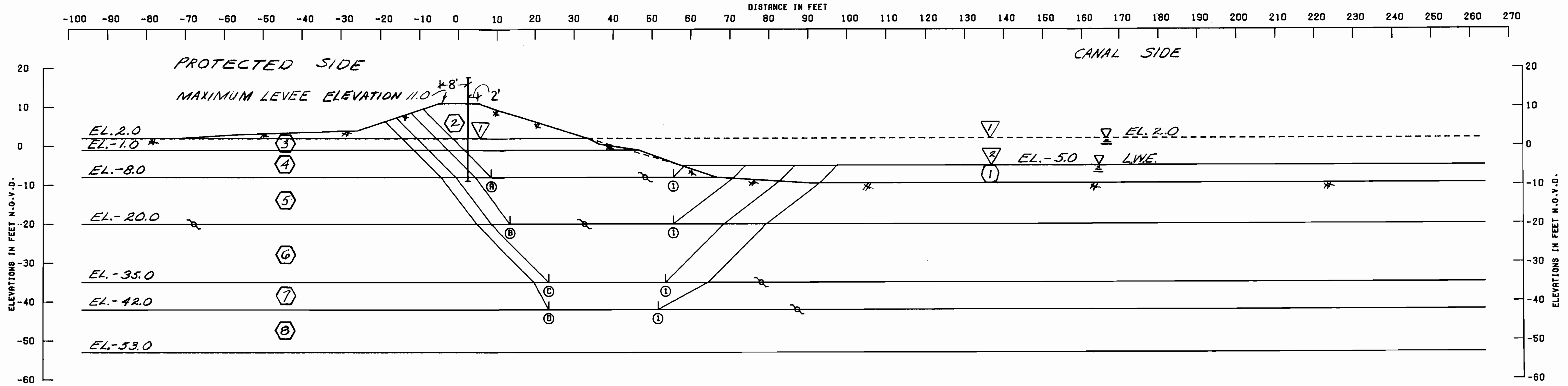
Φ -- ANGLE OF INTERNAL FRICTION, DEGREES
C -- UNIT COHESION, P.S.F.
∇ -- STATIC WATER SURFACE
D -- HORIZONTAL DRIVING FORCE IN POUNDS
R -- HORIZONTAL RESISTING FORCE IN POUNDS
A -- AS A SUBSCRIPT, REFERS TO ACTIVE WEDGE
B -- AS A SUBSCRIPT, REFERS TO CENTRAL BLOCK
P -- AS A SUBSCRIPT, REFERS TO PASSIVE WEDGE

$$\text{FACTOR OF SAFETY} = \frac{R_A + R_B + R_P}{D_A - D_P}$$

LAKE PONTCHARTRAIN, LA AND VICINITY
HIGH LEVEL PLAN
DESIGN MEMORANDUM NO. 19 GENERAL DESIGN

ORLEANS AVENUE OUTFALL CANAL
PROTECTED SIDE
LEVEE STABILITY ANALYSIS
STA. 90 + 50 TO STA. 104+00

U.S. ARMY ENGINEER DISTRICT, NEW ORLEANS
CORPS OF ENGINEERS
JUNE, 1988 FILE NO. H-2-30290



NOTE:
TOP ELEVATION AND TIP ELEVATION OF FLOODWALL VARIES.

▽ ▽ PH LINE IN STRATUM ⑦

② ② PH LINE IN STRATUM ⑤

STRATUM NO.	SOIL TYPE	EFFECTIVE UNIT WT. P.C.F.		C - UNIT COHESION - P.S.F.				FRICTION ANGLE DEGREES
				CENTER OF STRATUM		BOTTOM OF STRATUM		
		VERT. 1	VERT. 2	VERT. 1	VERT. 2	VERT. 1	VERT. 2	
1	(WATER)	62.5	62.5	0.0	0.0	0.0	0.0	0.0
2	(CH)	115.0	115.0	700.0	700.0	700.0	700.0	0.0
3	(CH)	112.0	112.0	600.0	600.0	600.0	600.0	0.0
4	(CH)	103.0	103.0	280.0	280.0	280.0	280.0	0.0
5	(ML)	117.0	117.0	200.0	200.0	200.0	200.0	15.0
6	(CH)	102.0	102.0	500.0	500.0	500.0	500.0	0.0
7	(SP)	122.0	122.0	0.0	0.0	0.0	0.0	33.0
8	(CH)	106.0	106.0	750.0	750.0	750.0	750.0	0.0

ASSUMED FAILURE SURFACE		RESISTING FORCES			DRIVING FORCES		SUMMATION OF FORCES		FACTOR OF SAFETY
NO.	ELEV.	R_A	R_B	R_P	D_A	$-D_P$	RESISTING	DRIVING	
A 1	-8.0	18196	13026	1539	19727	533	32761	19194	1.71
B 1	-20.0	28554	18837	9152	50844	11592	56543	39252	1.44
C 1	-35.0	42389	150CC	23205	108427	47255	80594	61172	1.32
D 1	-42.0	52623	21000	42208	142921	71170	115831	71751	1.61

GENERAL NOTES.

CLASSIFICATION, STRATIFICATION, SHEAR STRENGTH, AND UNIT WEIGHT OF THE SOIL WERE BASED ON THE RESULTS OF UNDISTURBED BORINGS. SEE BORING DATA PLATE 40

NOTES

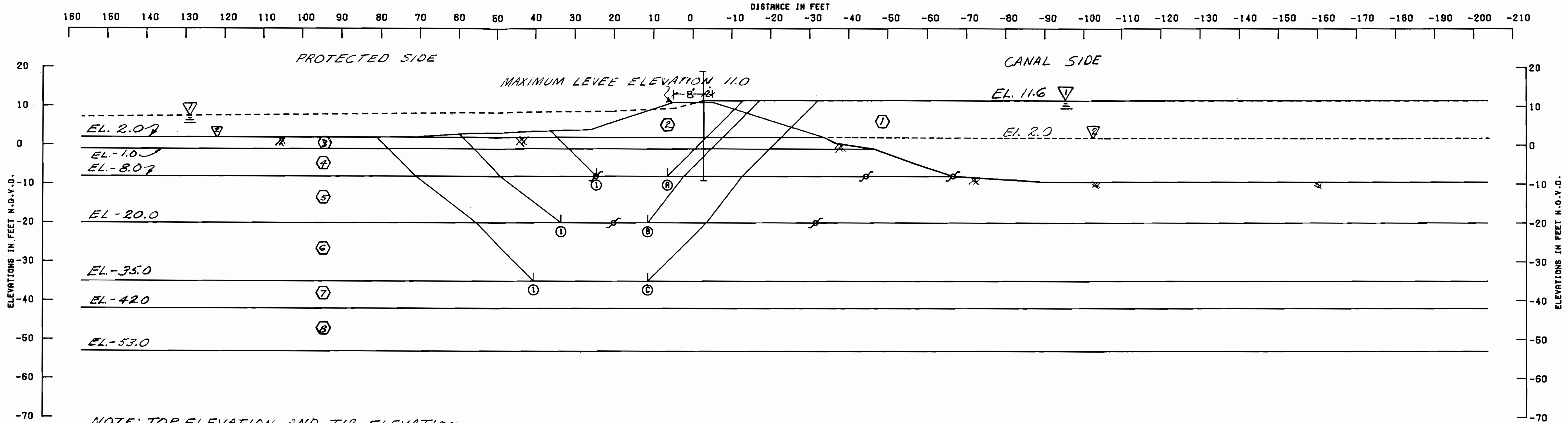
ϕ -- ANGLE OF INTERNAL FRICTION, DEGREES
C -- UNIT COHESION, P.S.F.
▽ -- STATIC WATER SURFACE
D -- HORIZONTAL DRIVING FORCE IN POUNDS
R -- HORIZONTAL RESISTING FORCE IN POUNDS
A -- AS A SUBSCRIPT, REFERS TO ACTIVE WEDGE
B -- AS A SUBSCRIPT, REFERS TO CENTRAL BLOCK
P -- AS A SUBSCRIPT, REFERS TO PASSIVE WEDGE

$$\text{FACTOR OF SAFETY} = \frac{R_A + R_B + R_P}{D_A - D_P}$$

LAKE PONTCHARTRAIN, LA. AND VICINITY
HIGH LEVEL PLAN
DESIGN MEMORANDUM NO. 19 GENERAL DESIGN
ORLEANS AVENUE OUTFALL CANAL

FLOODSIDE LEVEE STABILITY ANALYSIS
STA. 104 + 00 TO LAKEFRONT LEV.

U.S. ARMY ENGINEER DISTRICT, NEW ORLEANS
CORPS OF ENGINEERS
JUNE, 1988 FILE NO. H-2-30290



NOTE: TOP ELEVATION AND TIP ELEVATION OF FLOODWALL VARIES

▽ — ▽ PH LINE IN STRATUM ⑤

▽ — ▽ PH LINE IN STRATUM ⑦

STRATUM NO.	SOIL TYPE	EFFECTIVE UNIT WT. P.C.F.		C - UNIT COHESION - P.S.F.				FRICTION ANGLE DEGREES
				CENTER OF STRATUM		BOTTOM OF STRATUM		
		VERT. 1	VERT. 2	VERT. 1	VERT. 2	VERT. 1	VERT. 2	
1	(WATER)	62.5	62.5	0.0	0.0	0.0	0.0	0.0
2	(CH)	115.0	115.0	700.0	700.0	700.0	700.0	0.0
3	(CH)	112.0	112.0	600.0	600.0	600.0	600.0	0.0
4	(CH)	103.0	103.0	280.0	280.0	280.0	280.0	0.0
5	(ML)	117.0	117.0	200.0	200.0	200.0	200.0	15.0
6	(CH)	102.0	102.0	500.0	500.0	500.0	500.0	0.0
7	(SP)	122.0	122.0	0.0	0.0	0.0	0.0	33.0
8	(CH)	106.0	106.0	750.0	750.0	750.0	750.0	0.0

ASSUMED FAILURE SURFACE NO.	ELEV.	RESISTING FORCES R_A	R_B	R_P	DRIVING FORCES D_A	$-D_P$	SUMMATION OF FORCES RESISTING	DRIVING	FACTOR OF SAFETY
A 1	-8.0	17601	5040	9853	20296	7751	32494	12545	2.59
B 1	-20.0	25936	10366	19288	52431	29818	55590	22613	2.46
C 1	-35.0	35644	14500	32424	113368	77877	82568	35491	2.33

GENERAL NOTES:

CLASSIFICATION, STRATIFICATION, SHEAR STRENGTH, AND UNIT WEIGHT OF THE SOIL WERE BASED ON THE RESULTS OF UNDISTURBED BORINGS. SEE BORING DATA PLATE 40

NOTES

- ϕ -- ANGLE OF INTERNAL FRICTION, DEGREES
- C -- UNIT COHESION, P.S.F.
- ▽ -- STATIC WATER SURFACE
- D -- HORIZONTAL DRIVING FORCE IN POUNDS
- R -- HORIZONTAL RESISTING FORCE IN POUNDS
- A -- AS A SUBSCRIPT, REFERS TO ACTIVE WEDGE
- B -- AS A SUBSCRIPT, REFERS TO CENTRAL BLOCK
- P -- AS A SUBSCRIPT, REFERS TO PASSIVE WEDGE

$$\text{FACTOR OF SAFETY} = \frac{R_A + R_B + R_P}{D_A - D_P}$$

LAKE PONTCHARTRAIN, LA. AND VICINITY
HIGH LEVEL PLAN

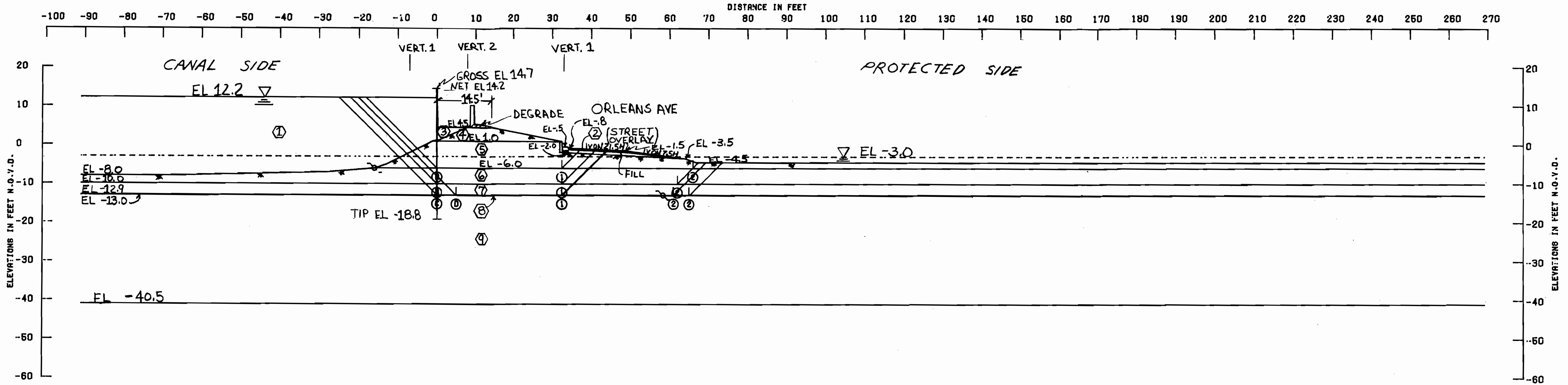
DESIGN MEMORANDUM NO. 19 GENERAL DESIGN

ORLEANS AVENUE OUTFALL CANAL

PROTECTED SIDE
LEVEE STABILITY ANALYSIS
STA. 104+00 TO LAKEFRONT LEVEE

U.S. ARMY ENGINEER DISTRICT, NEW ORLEANS
CORPS OF ENGINEERS

JUNE, 1988 FILE NO. H-2-30290



ASSUMED FAILURE SURFACE NO.	ASSUMED FAILURE SURFACE ELEV.	RESISTING FORCES R_A	R_B	R_P	DRIVING FORCES D_A	$-D_P$	SUMMATION OF FORCES RESISTING	DRIVING	FACTOR OF SAFETY
A 1	-6.0	3001	7912	3252	11048	1533	14165	9515	1.49
A 2	-6.0	3001	13037	900	11048	129	16538	10919	1.55
B 1	-10.0	3669	7912	4347	16873	4219	15928	12654	1.26
B 2	-10.0	3669	12437	2100	16873	1692	18206	15181	1.20
C 1	-12.9	4308	9537	5460	21833	6983	19305	14850	1.30
C 2	-12.9	4308	15300	3260	21833	3555	22868	18278	1.25
D 1	-13.0	5830	17486	5573	21228	7082	28889	14146	2.04
D 2	-13.0	5830	26311	3305	21228	3174	35446	18054	1.96

STRATUM NO.	SOIL TYPE	EFFECTIVE UNIT WT. P.C.F. VERT. 1	EFFECTIVE UNIT WT. P.C.F. VERT. 2	C - UNIT COHESION - P.S.F. CENTER OF STRATUM VERT. 1	CENTER OF STRATUM VERT. 2	BOTTOM OF STRATUM VERT. 1	BOTTOM OF STRATUM VERT. 2	FRICTION ANGLE DEGREES
1	(WATER)	62.5	62.5	0.0	0.0	0.0	0.0	0.0
2	(CH)	150.0	150.0	400.0	400.0	400.0	400.0	0.0
3	(CH)	110.0	110.0	400.0	400.0	400.0	400.0	0.0
4	(CH)	115.0	115.0	700.0	700.0	700.0	700.0	0.0
5	(CH)	100.0	100.0	300.0	300.0	300.0	300.0	0.0
6	(CH)	75.0	84.0	150.0	250.0	150.0	250.0	0.0
7	(CH)	100.0	100.0	200.0	300.0	200.0	300.0	0.0
8	(SP)	122.0	122.0	0.0	0.0	0.0	0.0	33.0
9	(SP)	122.0	122.0	0.0	0.0	0.0	0.0	33.0

GENERAL NOTES:

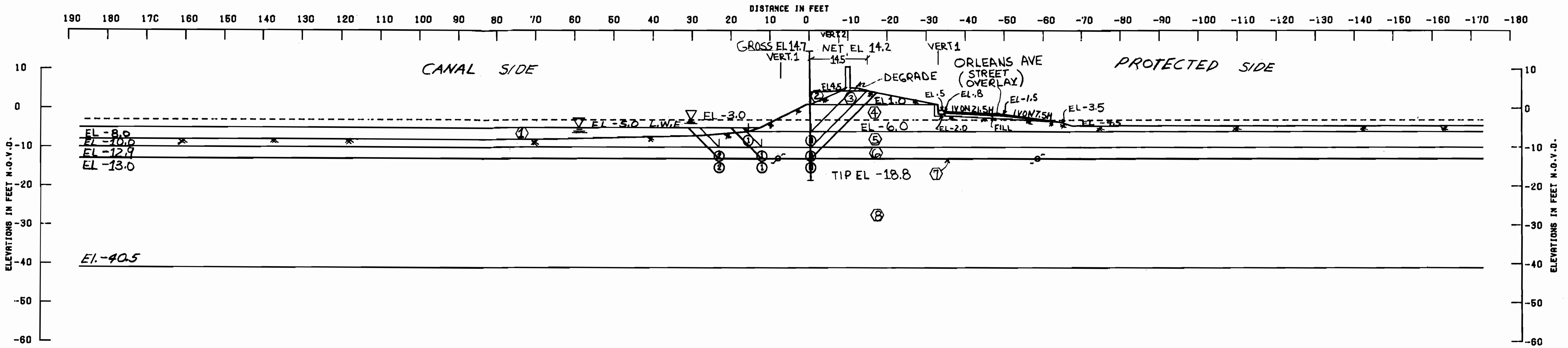
CLASSIFICATION, STRATIFICATION, SHEAR STRENGTH, AND UNIT WEIGHT OF THE SOIL WERE BASED ON THE RESULTS OF UNDISTURBED BORINGS. SEE BORING DATA PLATE 40

NOTES

ϕ --- ANGLE OF INTERNAL FRICTION, DEGREES
C --- UNIT COHESION, P.S.F.
∇ --- STATIC WATER SURFACE
D --- HORIZONTAL DRIVING FORCE IN POUNDS
R --- HORIZONTAL RESISTING FORCE IN POUNDS
A --- AS A SUBSCRIPT, REFERS TO ACTIVE WEDGE
B --- AS A SUBSCRIPT, REFERS TO CENTRAL BLOCK
P --- AS A SUBSCRIPT, REFERS TO PASSIVE WEDGE

$$\text{FACTOR OF SAFETY} = \frac{R_A + R_B + R_P}{D_A - D_P}$$

LAKE PONTCHARTRAIN, LA AND VICINITY
HIGH LEVEL PLAN
DESIGN MEMORANDUM NO.19 - GENERAL DESIGN
ORLEANS AVENUE OUTFALL CANAL
PROTECTED SIDE LEVEE
STABILITY ANALYSIS
STA. 0+00 TO 22+40
STA. 23+40 TO 29+40 WEST SIDE
U.S. ARMY ENGINEER DISTRICT, NEW ORLEANS
CORPS OF ENGINEERS
JUNE 1988 FILE NO. H-2-30290



ASSUMED FAILURE NO.		SURFACE ELEV.	RESISTING FORCES R_A	R_B	R_P	DRIVING FORCES D_A	$-D_P$	SUMMATION OF FORCES RESISTING	DRIVING	FACTOR OF SAFETY
(A)	(1)	-6.0	9099	2563	0	5763	31	11662	5732	2.03
(B)	(1)	-10.0	10780	2038	1188	10816	962	14006	9854	1.42
(B)	(2)	-10.0	10780	3688	935	10816	847	15403	9969	1.55
(C)	(1)	-12.9	11761	2372	2281	15298	2428	16414	12870	1.28
(C)	(2)	-12.9	11761	2646	2050	15298	2283	16457	13015	1.26
(D)	(1)	-13.0	11827	3397	2300	15465	2489	17524	12976	1.35
(D)	(2)	-13.0	11827	3714	2056	15465	2347	17597	13118	1.34

STRATUM NO.	SOIL TYPE	EFFECTIVE UNIT WT. P.C.F. VERT. 1	VERT. 2	C - UNIT COHESION - P.S.F. CENTER OF STRATUM VERT. 1	VERT. 2	BOTTOM OF STRATUM VERT. 1	VERT. 2	FRICTION ANGLE DEGREES
1	(WATER)	62.5	62.5	0.0	0.0	0.0	0.0	0.0
2	(CH)	110.0	110.0	400.0	400.0	400.0	400.0	0.0
3	(CH)	115.0	115.0	700.0	700.0	700.0	700.0	0.0
4	(CH)	100.0	100.0	300.0	300.0	300.0	300.0	0.0
5	(CH)	75.0	84.0	150.0	250.0	150.0	250.0	0.0
6	(CH)	100.0	100.0	200.0	300.0	200.0	300.0	0.0
7	(SP)	122.0	122.0	0.0	0.0	0.0	0.0	33.0
8	(SP)	122.0	122.0	0.0	0.0	0.0	0.0	33.0

GENERAL NOTES:

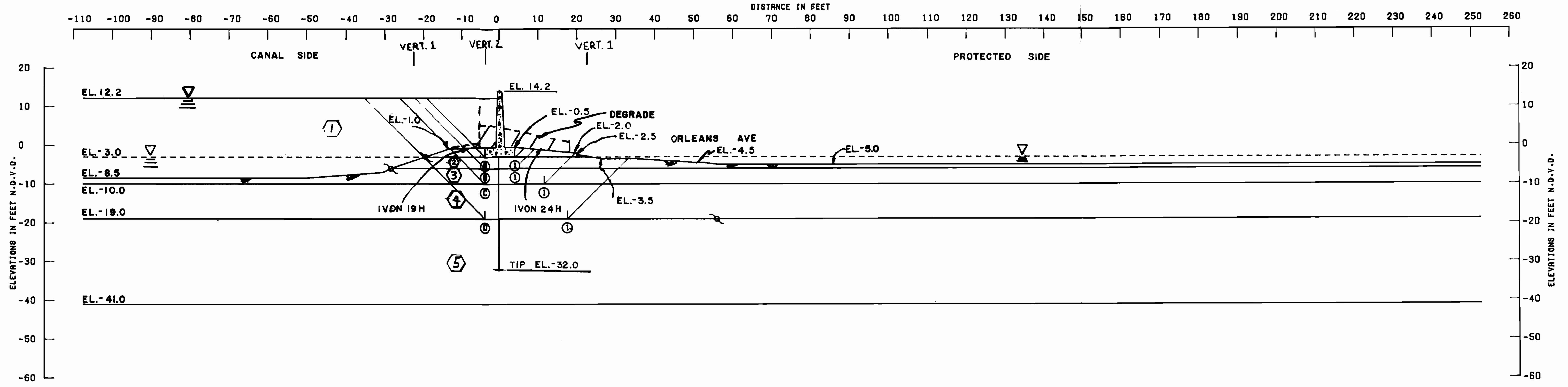
CLASSIFICATION, STRATIFICATION, SHEAR STRENGTH, AND UNIT WEIGHT OF THE SOIL WERE BASED ON THE RESULTS OF UNDISTURBED BORINGS. SEE BORING DATA PLATE 40

NOTES

ϕ --- ANGLE OF INTERNAL FRICTION, DEGREES
C --- UNIT COHESION, P.S.F.
∇ --- STATIC WATER SURFACE
D --- HORIZONTAL DRIVING FORCE IN POUNDS
R --- HORIZONTAL RESISTING FORCE IN POUNDS
A --- AS A SUBSCRIPT, REFERS TO ACTIVE WEDGE
B --- AS A SUBSCRIPT, REFERS TO CENTRAL BLOCK
P --- AS A SUBSCRIPT, REFERS TO PASSIVE WEDGE

$$\text{FACTOR OF SAFETY} = \frac{R_A + R_B + R_P}{D_A - D_P}$$

LAKE PONTCHARTRAIN, LA. AND VICINITY
HIGH LEVEL PLAN
DESIGN MEMORANDUM NO. 19 - GENERAL DESIGN
ORLEANS AVENUE OUTFALL CANAL
FLOOD SIDE LEVEE
STABILITY ANALYSIS
STA. 0+00 TO 22+40
STA. 23+40 TO 29+40 WEST SIDE
U.S. ARMY ENGINEER DISTRICT, NEW ORLEANS
CORPS OF ENGINEERS
JUNE 1968 FILE NO. H-2-30290



NOTE: ANALYSIS WAS PERFORMED WITH A FACTOR OF SAFETY OF 1.3 INCORPORATED INTO THE SOIL PARAMETERS.

STRATUM NO.	SOIL TYPE	EFFECTIVE UNIT WT. P.C.F.		C - UNIT COHESION - P.S.F.				FRICTION ANGLE DEGREES
				CENTER OF STRATUM		BOTTOM OF STRATUM		
		VERT. 1	VERT. 2	VERT. 1	VERT. 2	VERT. 1	VERT. 2	
1	(WATER)	62.5	62.5	0.0	0.0	0.0	0.0	0.0
2	(CH)	100.0	100.0	231.0	231.0	231.0	231.0	0.0
3	(CH)	100.0	100.0	231.0	231.0	231.0	231.0	0.0
4	(CH)	75.0	84.0	115.0	192.0	115.0	192.0	0.0
5	(CH)	100.0	100.0	154.0	231.0	154.0	231.0	0.0
6	(SP)	122.0	122.0	0.0	0.0	0.0	0.0	26.5

NO.	ELEV.	$U_A = D_A - R_A$		$U_P = R_B + R_P + D_P$			U_A	U_P	$U_A - U_P$
		D_A	R_A	R_B	R_P	D_P			
BASE	-3.0	7329	0	1848	0	0	7329	1848	5481
1	-6.0	10887	1318	1536	1267	1382	9569	4185	5384
2	-10.0	16878	3858	2976	3384	3400	13020	9760	3260
3	-19.0	35481	6623	4966	4985	11690	28858	21641	7217

GENERAL NOTES:

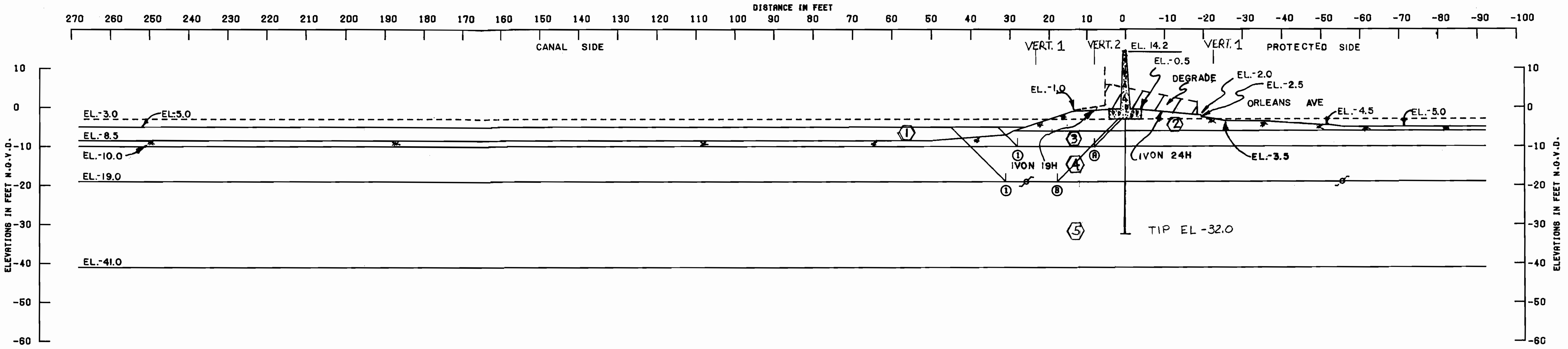
CLASSIFICATION, STRATIFICATION, SHEAR STRENGTH, AND UNIT WEIGHT OF THE SOIL WERE BASED ON THE RESULTS OF UNDISTURBED BORINGS. SEE BORING DATA PLATE 40

NOTES

ϕ -- ANGLE OF INTERNAL FRICTION, DEGREES
C -- UNIT COHESION, P.S.F.
∇ -- STATIC WATER SURFACE
D -- HORIZONTAL DRIVING FORCE IN POUNDS
R -- HORIZONTAL RESISTING FORCE IN POUNDS
A -- AS A SUBSCRIPT, REFERS TO ACTIVE WEDGE
B -- AS A SUBSCRIPT, REFERS TO CENTRAL BLOCK
P -- AS A SUBSCRIPT, REFERS TO PASSIVE WEDGE

FACTOR OF SAFETY = $\frac{R_A + R_B + R_P}{D_A - D_P}$

LAKE PONTCHARTRAIN, LA. AND VICINITY
HIGH LEVEL PLAN
DESIGN MEMORANDUM NO. 19 - GENERAL DESIGN
ORLEANS AVENUE OUTFALL CANAL
FLOOD SIDE LEVEE
DEEP SEATED STABILITY ANALYSIS
STA. 29+40 TO STA. 50+00
WEST SIDE
U.S. ARMY ENGINEER DISTRICT, NEW ORLEANS
CORPS OF ENGINEERS
JUNE 1988 FILE NO. H-2-30290



STRATUM NO.	SOIL TYPE	EFFECTIVE UNIT WT. P.C.F.		C - UNIT COHESION - P.S.F.				FRICTION ANGLE DEGREES
				CENTER OF STRATUM		BOTTOM OF STRATUM		
		VERT. 1	VERT. 2	VERT. 1	VERT. 2	VERT. 1	VERT. 2	
1	(WATER)	62.5	62.5	0.0	0.0	0.0	0.0	0.0
2	(CH)	100.0	100.0	300.0	300.0	300.0	300.0	0.0
3	(CH)	75.0	84.0	150.0	250.0	150.0	250.0	0.0
4	(CH)	100.0	100.0	200.0	300.0	200.0	300.0	0.0
5	(SP)	122.0	122.0	0.0	0.0	0.0	0.0	33.0

ASSUMED FAILURE SURFACE			RESISTING FORCES			DRIVING FORCES		SUMMATION OF FORCES		FACTOR OF SAFETY
NO.		ELEV.	R_A	R_B	R_P	D_A	$-D_P$	RESISTING	DRIVING	
A	1	-10.0	5352	3750	900	4651	869	10002	3782	2.64
B	1	-19.0	10117	2563	4249	15871	7974	16929	7897	2.14

GENERAL NOTES:

CLASSIFICATION, STRATIFICATION, SHEAR STRENGTH, AND UNIT WEIGHT OF THE SOIL WERE BASED ON THE RESULTS OF UNDISTURBED BORINGS. SEE BORING DATA PLATE 40

NOTES

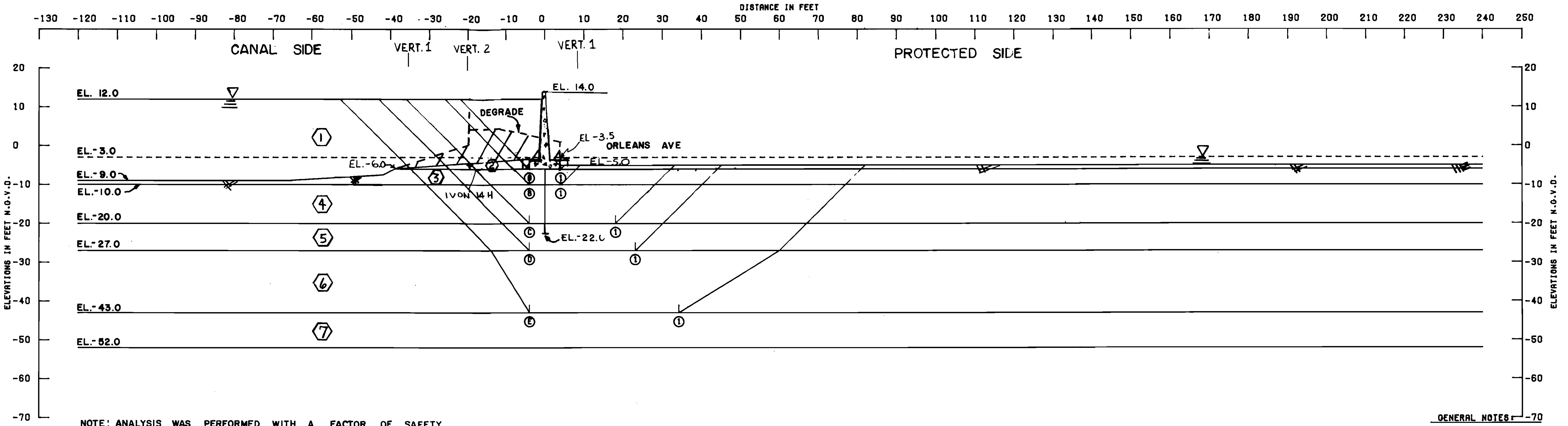
ϕ -- ANGLE OF INTERNAL FRICTION, DEGREES
C -- UNIT COHESION, P.S.F.
∇ -- STATIC WATER SURFACE
D -- HORIZONTAL DRIVING FORCE IN POUNDS
R -- HORIZONTAL RESISTING FORCE IN POUNDS
A -- AS A SUBSCRIPT, REFERS TO ACTIVE WEDGE
B -- AS A SUBSCRIPT, REFERS TO CENTRAL BLOCK
P -- AS A SUBSCRIPT, REFERS TO PASSIVE WEDGE

$$\text{FACTOR OF SAFETY} = \frac{R_A + R_B + R_P}{D_A - D_P}$$

LAKE PONTCHARTRAIN, LA. AND VICINITY
HIGH LEVEL PLAN
DESIGN MEMORANDUM NO. 19 GENERAL DESIGN
ORLEANS AVENUE OUTFALL CANAL

FLOOD SIDE STABILITY ANALYSIS
STA. 29 + 40 TO STA. 50 + 00
WEST SIDE

U.S. ARMY ENGINEER DISTRICT, NEW ORLEANS
CORPS OF ENGINEERS
JUNE, 1988 FILE NO. H-2-30290



NOTE: ANALYSIS WAS PERFORMED WITH A FACTOR OF SAFETY OF 1.3 INCORPORATED INTO THE SOIL PARAMETERS.

STRATUM NO.	SOIL TYPE	EFFECTIVE UNIT WT. P.C.F.		C - UNIT COHESION - P.S.F.				FRICTION ANGLE DEGREES
				CENTER OF STRATUM		BOTTOM OF STRATUM		
		VERT. 1	VERT. 2	VERT. 1	VERT. 2	VERT. 1	VERT. 2	
1	(WATER)	62.5	62.5	0.0	0.0	0.0	0.0	0.0
2	(CH)	100.0	100.0	231.0	231.0	231.0	231.0	0.0
3	(CH)	75.0	84.0	115.0	192.0	115.0	192.0	0.0
4	(CH)	100.0	100.0	154.0	231.0	154.0	231.0	0.0
5	(CH)	100.0	100.0	231.0	250.0	231.0	250.0	0.0
6	(SP)	122.0	122.0	0.0	0.0	0.0	0.0	26.5
7	(CH)	105.0	105.0	485.0	485.0	485.0	485.0	0.0

NO.	ELEV.	$U_A = D_A - R_A$		$U_P = R_B + R_P + D_P$			U_A	U_P	$U_A - U_P$
		D_A	R_A	R_B	R_P	D_P			
BASE	-6.0	10230	0	1536	0	0	10230	1536	8694
1	-10.0	15731	1413	1536	1752	1093	14318	4381	9937
2	-20.0	35991	6803	4196	4462	10050	29188	18708	10480
3	-27.0	55960	9964	6436	7696	22299	45996	36431	9565
4	-43.0	122673	30535	18430	35435	71513	92138	125378	-33240

GENERAL NOTES:

CLASSIFICATION, STRATIFICATION, SHEAR STRENGTH, AND UNIT WEIGHT OF THE SOIL WERE BASED ON THE RESULTS OF UNDISTURBED BORINGS. SEE BORING DATA PLATE 40

NOTES

ϕ -- ANGLE OF INTERNAL FRICTION, DEGREES
C -- UNIT COHESION, P.S.F.
∇ -- STATIC WATER SURFACE
D -- HORIZONTAL DRIVING FORCE IN POUNDS
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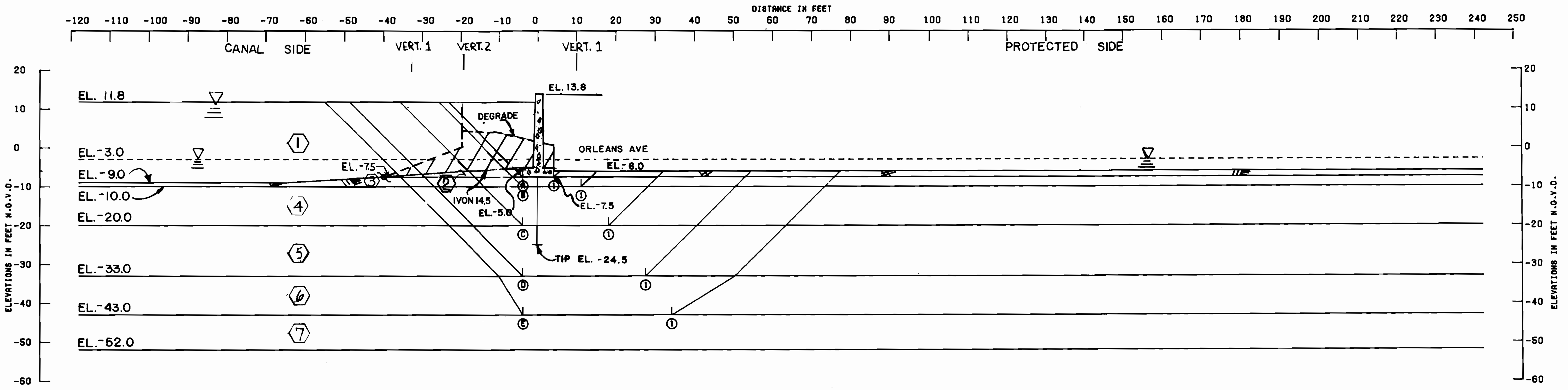
A -- AS A SUBSCRIPT, REFERS TO ACTIVE WEDGE
B -- AS A SUBSCRIPT, REFERS TO CENTRAL BLOCK
P -- AS A SUBSCRIPT, REFERS TO PASSIVE WEDGE

$$\text{FACTOR OF SAFETY} = \frac{R_A + R_B + R_P}{D_A - D_P}$$

LAKE PONTCHARTRAIN, LA AND VICINITY
HIGH LEVEL PLAN
DESIGN MEMORANDUM NO. 19 GENERAL DESIGN
ORLEANS AVENUE OUTFALL CANAL
DEEP SEATED STABILITY ANALYSIS
STA. 50+00 TO STA. 64+00
WEST SIDE
U.S. ARMY ENGINEER DISTRICT, NEW ORLEANS
CORPS OF ENGINEERS
JUNE 1988 FILE NO. H-2-30290



NOTE: ANALYSIS WAS PERFORMED WITH A FACTOR OF SAFETY OF 1.3 INCORPORATED INTO THE SOIL PARAMETERS.

STRATUM NO.	SOIL TYPE	EFFECTIVE UNIT WT. P.C.F.		C - UNIT COHESION - P.S.F.				FRICTION ANGLE DEGREES
				CENTER OF STRATUM		BOTTOM OF STRATUM		
		VERT. 1	VERT. 2	VERT. 1	VERT. 2	VERT. 1	VERT. 2	
1		62.5	62.5	0.0	0.0	0.0	0.0	0.0
2	(CH)	75.0	84.0	115.0	192.0	115.0	192.0	0.0
3	(CH)	75.0	84.0	115.0	192.0	115.0	192.0	0.0
4	(CH)	100.0	100.0	154.0	231.0	154.0	231.0	0.0
5	(CH)	100.0	100.0	231.0	250.0	231.0	250.0	0.0
6	(SP)	122.0	122.0	0.0	0.0	0.0	0.0	26.5
7	(CH)	105.0	105.0	485.0	485.0	485.0	485.0	0.0

NO.	ELEV.	$U_A = D_A - R_A$		$U_P = R_B + R_P + D_P$			U_A	U_P	$U_A - U_P$
		D_A	R_A	R_B	R_P	D_P			
BASE	-7.5	11699	0	1536	0	0	11699	1536	10163
1	-10.0	15098	0	2610	920	600	15098	4130	10968
2	-20.0	34659	6169	4273	4000	8600	28490	16873	11617
3	-33.0	74706	11586	7472	10006	33949	63120	51427	11693
4	-43.0	118100	24211	18430	26481	66048	93889	110959	-17070

GENERAL NOTES:

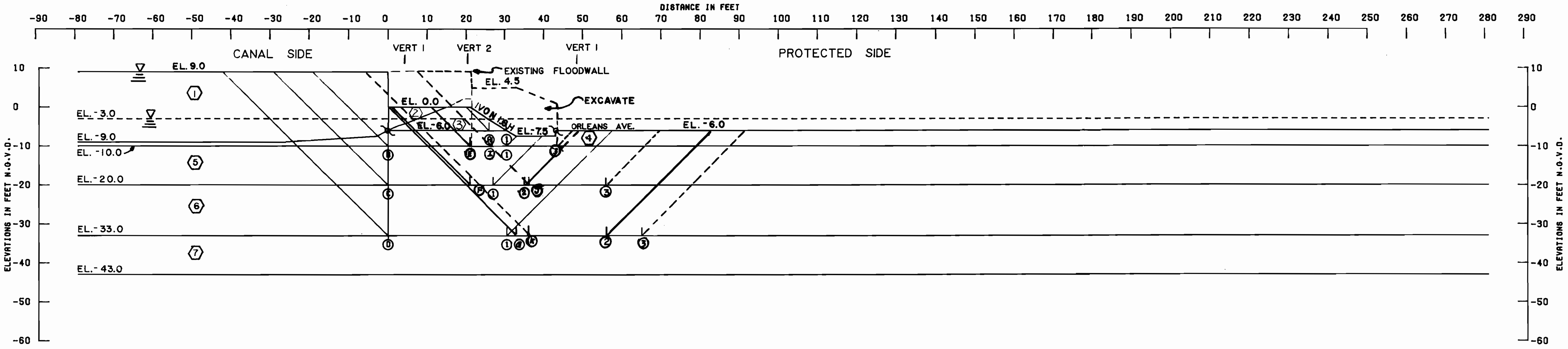
CLASSIFICATION, STRATIFICATION, SHEAR STRENGTH, AND UNIT WEIGHT OF THE SOIL WERE BASED ON THE RESULTS OF UNDISTURBED BORINGS. SEE BORING DATA PLATES.

NOTES

ϕ -- ANGLE OF INTERNAL FRICTION, DEGREES
C -- UNIT COHESION, P.S.F.
∇ -- STATIC WATER SURFACE
D -- HORIZONTAL DRIVING FORCE IN POUNDS
R -- HORIZONTAL RESISTING FORCE IN POUNDS
A -- AS A SUBSCRIPT, REFERS TO ACTIVE WEDGE
B -- AS A SUBSCRIPT, REFERS TO CENTRAL BLOCK
P -- AS A SUBSCRIPT, REFERS TO PASSIVE WEDGE

$$\text{FACTOR OF SAFETY} = \frac{R_A + R_B + R_P}{D_A - D_P}$$

LAKE PONTCHARTRAIN, LA. AND VICINITY
HIGH LEVEL PLAN
DESIGN MEMORANDUM NO.19 - GENERAL DESIGN
ORLEANS AVENUE OUTFALL CANAL
FLOOD SIDE LEVEE
DEEP SEATED STABILITY ANALYSIS
STA. 64+00 TO STA. 90+50
WEST SIDE
U.S. ARMY ENGINEER DISTRICT, NEW ORLEANS
CORPS OF ENGINEERS
JUNE 1988
FILE NO. H-2-30290



NOTE: DASHED LINES REPRESENT
EXISTING CONDITIONS, WEDGES I-3, J-3, AND K-3

STRATUM NO.	SOIL TYPE	EFFECTIVE UNIT WT. P.C.F.		C - UNIT COHESION - P.S.F.				FRICTION ANGLE DEGREES
				CENTER OF STRATUM		BOTTOM OF STRATUM		
		VERT. 1	VERT. 2	VERT. 1	VERT. 2	VERT. 1	VERT. 2	
1	(WATER)	62.5	62.5	0.0	0.0	0.0	0.0	0.0
2	(CH)	105.0	105.0	250.0	250.0	250.0	250.0	0.0
3	(CH)	100.0	100.0	300.0	300.0	300.0	300.0	0.0
4	(CH)	75.0	84.0	150.0	250.0	150.0	250.0	0.0
5	(CH)	100.0	100.0	200.0	300.0	200.0	300.0	0.0
6	(CH)	100.0	100.0	300.0	325.0	300.0	325.0	0.0
7	(SP)	122.0	122.0	0.0	0.0	0.0	0.0	33.0

ASSUMED FAILURE SURFACE		RESISTING FORCES			DRIVING FORCES		SUMMATION OF FORCES		FACTOR OF SAFETY
NO.	ELEV.	R_A	R_B	R_P	D_A	$-D_P$	RESISTING	DRIVING	
A 1	-6.0	3597	1125	-2	1007	0	4720	1007	4.69
B 1	-10.0	801	6275	1250	11345	419	8326	10926	0.76
C 1	-20.0	4583	6750	7294	28500	8369	18627	20131	0.93
D 1	-33.0	12153	9575	13850	65640	33085	35578	32555	1.09
E 2	-10.0	5379	2375	1250	4872	419	9004	4453	2.02
F 2	-20.0	9894	4200	7520	19192	8029	21614	11163	1.94
G 2	-33.0	18083	7237	13000	48288	33949	38320	14339	2.67
I 3	-10.0	5803	4375	1760	13072	682	11938	12390	0.96
J 3	-20.0	11803	5050	5200	32272	8600	22053	23672	0.93
K 3	-33.0	17061	8962	13000	72318	33949	39023	38369	1.02

GENERAL NOTES:

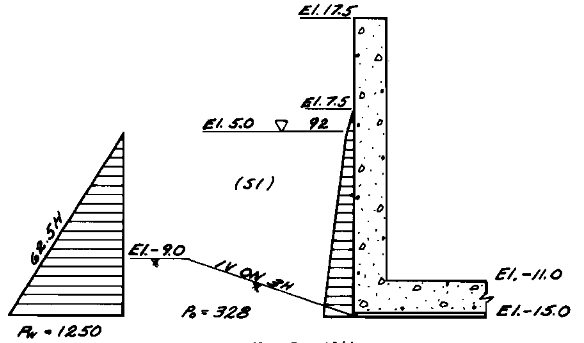
CLASSIFICATION, STRATIFICATION, SHEAR STRENGTH, AND UNIT WEIGHT OF THE SOIL WERE BASED ON THE RESULTS OF UNDISTURBED BORINGS. SEE BORING DATA PLATE 39

NOTES

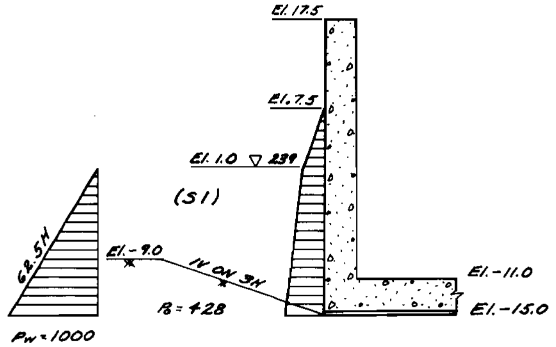
ϕ -- ANGLE OF INTERNAL FRICTION, DEGREES
C -- UNIT COHESION, P.S.F.
∇ -- STATIC WATER SURFACE
D -- HORIZONTAL DRIVING FORCE IN POUNDS
R -- HORIZONTAL RESISTING FORCE IN POUNDS
A -- AS A SUBSCRIPT, REFERS TO ACTIVE WEDGE
B -- AS A SUBSCRIPT, REFERS TO CENTRAL BLOCK
P -- AS A SUBSCRIPT, REFERS TO PASSIVE WEDGE

$$\text{FACTOR OF SAFETY} = \frac{R_A + R_B + R_P}{D_A - D_P}$$

LAKE PONTCHARTRAIN, LA AND VICINITY
HIGH LEVEL PLAN
DESIGN MEMORANDUM NO. 19 GENERAL DESIGN
ORLEANS AVENUE OUTFALL CANAL
TEMPORARY COFFERDAM
STABILITY ANALYSIS
STA. 64+00 TO STA. 90+50 WEST SIDE
U.S. ARMY ENGINEER DISTRICT, NEW ORLEANS
CORPS OF ENGINEERS
JUNE 1988 FILE NO. H-2-30290

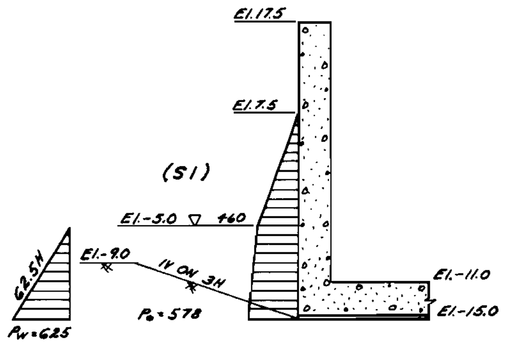


EAST WALL
UNWATERED CASE
VERTICAL & LATERAL EARTH PRESSURE



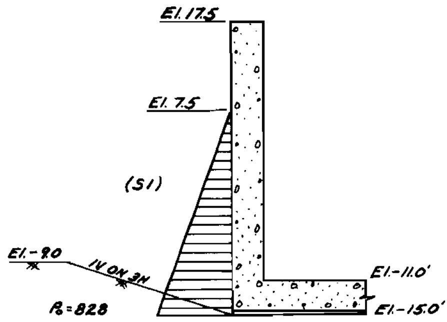
NOTE: Pw ACTS ON BOTH SIDES OF THE WALL

EAST WALL
NORMAL OPERATING CASE
VERTICAL & LATERAL EARTH PRESSURE

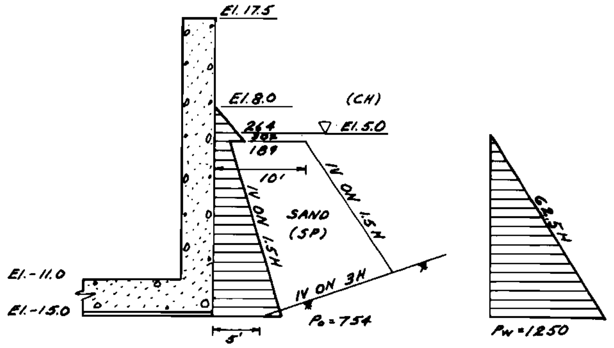


NOTE: Pw ACTS ON BOTH SIDES OF THE WALL

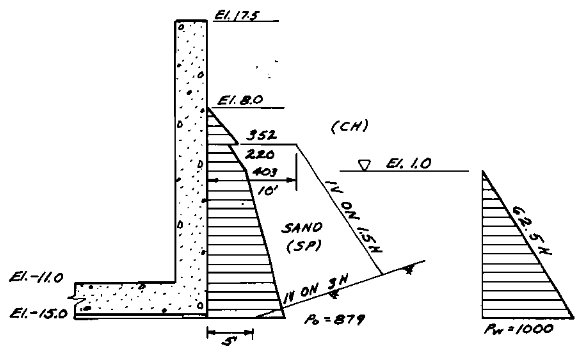
EAST WALL
LOW WATER OPERATING CASE
VERTICAL & LATERAL EARTH PRESSURE



EAST WALL
CONSTRUCTION CASE
VERTICAL & LATERAL EARTH PRESSURE

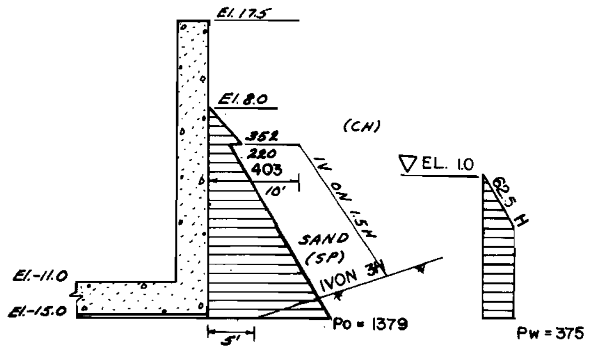


WEST WALL
UNWATERED CASE
VERTICAL & LATERAL EARTH PRESSURE

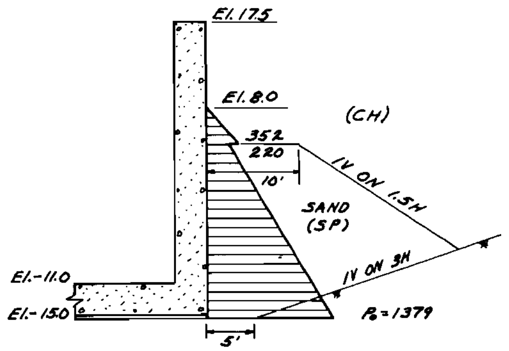


NOTE: Pw ACTS ON BOTH SIDES OF THE WALL

WEST WALL
NORMAL OPERATING CASE
VERTICAL & LATERAL EARTH PRESSURE

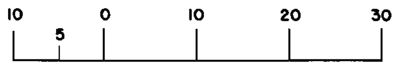


WEST WALL
LOW WATER OPERATING CASE
VERTICAL & LATERAL EARTH PRESSURE



WEST WALL
CONSTRUCTION CASE
VERTICAL & LATERAL EARTH PRESSURE

SCALE: 1"=20'



	γPCF	Ko
CH	110	0.8
SP	122	0.5
SI	92	0.4

NOTE:
ALL PRESSURES ARE GIVEN IN UNITS OF P.S.F.
LOW WATER OPERATING CONDITION IS EL. -5.0
UNWATERED CONDITION IS EL. 5.0

LAKE PONTCHARTRAIN, LA. AND VICINITY
HIGH LEVEL PLAN
DESIGN MEMORANDUM NO. 19 GENERAL DESIGN
ORLEANS AVENUE OUTFALL CANAL

LATERAL EARTH PRESSURES

U.S. ARMY ENGINEER DISTRICT, NEW ORLEANS
CORPS OF ENGINEERS

JUNE 1988 FILE NO. H-2-30290

(1) **Assumptions:** Line Source, Artesian Flow Fully Penetrating Infinite Line of Wells

Aquifer 1 (ML/SM) El. -8.0 to El. -20.0

Aquifer 2 (SM/SP) El. -32.0 to El. -42.0

Transformation:

$K_h/K_v = 4$

$\bar{d}_1 = 12'\sqrt{\frac{K_{h_1}}{K_{v_1}}} = 24'$; $d_2 = 10'\sqrt{\frac{K_{h_2}}{K_{v_2}}} = 20'$ (E-1)

$K_1 = K_2 = \sqrt{K_h K_v} = \sqrt{(109\times10^{-4})(27\times10^{-4})} = 0.00543$ cm/sec

Wellpoints Drawdown to El. -18.0; Hurricane Stage El. +9.0 Aquifer 1
El. +2.0 Aquifer 2

Assuming an equivalent continuous slot

Aquifer 1 $H=29'$ $h_e = h_D = 2'$ $V=15'$ $r_w = .479$ $D=24'$ $H-h_w \approx 28'$

$R = C(H-h_w)\sqrt{K} = 3(28')\sqrt{54.3} = 620'$ Fig. 4-23 Eq. 1

$K = .01069$ fpm $a = 15'$

Assuming 15' spacing between Wellpoints

$Q_w = \frac{KDa}{L}(H-h_e) = \frac{(.01069)(24')(15')(29-2')}{620'} = .168$ cfm Fig 4-1 Eq 1

$\Delta h_w = \left(\frac{Q_w}{2\pi KD}\right)\ln\left(\frac{a}{2\pi r_w}\right) = \left(\frac{.168}{2\pi(.01069)(24')}\right)\ln\left(\frac{15'}{2\pi(.479')}\right) = .167$ Fig 4-20 Eq 1

Aquifer 2

$H=44'$ $h_e = h_D = 24'$ $V=15'$ $r_w = .479$ $D=20'$ $H-h_w \approx 25'$

$K = .01069$ fpm $a = 15'$

$R = C(H-h_w)\sqrt{K} = 3(25')\sqrt{54.3} = 553$ Fig. 4-23 Eq 1

$Q_w = \frac{KDa}{L}(H-h_e) = \frac{(.01069)(20')(15')(44-24')}{553} = 0.113$ cfm Fig 4-1 Eq. 1

Q_w TOTAL = 0.167 cfm + 0.116 cfm = .283 cfm

$\Delta h_w = \left(\frac{Q_w}{2\pi KD}\right)\ln\left(\frac{a}{2\pi r_w}\right) = \left(\frac{.116}{2\pi(.01069)(20')}\right)\ln\left(\frac{15}{2\pi(.479)}\right) = .14'$ Fig 4-20 Eq 1

Δh_w = total = .14' + .167' = .31'

Head loss in Wellpoints

$H_w = H_e + H_s + H_r + H_v$ Fig 4-25

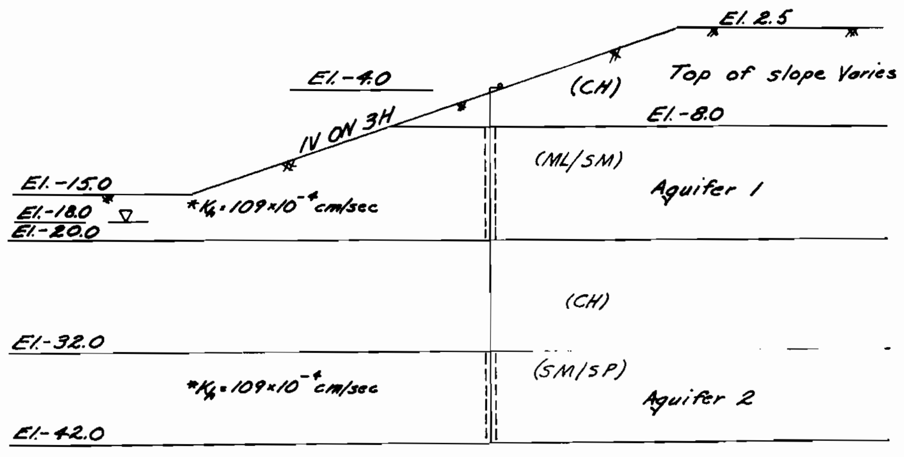
Assuming 3 ft. screen

$H_w \approx 0$ Due to Low Flow

$M = V + h_e - \Delta h_w - H_w$

$M = 15 + 2' - .31' = 16.69'$ Set header no higher than El. -3.31

$M = 15 + 24' - .31' = 38.69$ " " " " " El. -3.31



SECTION A-A

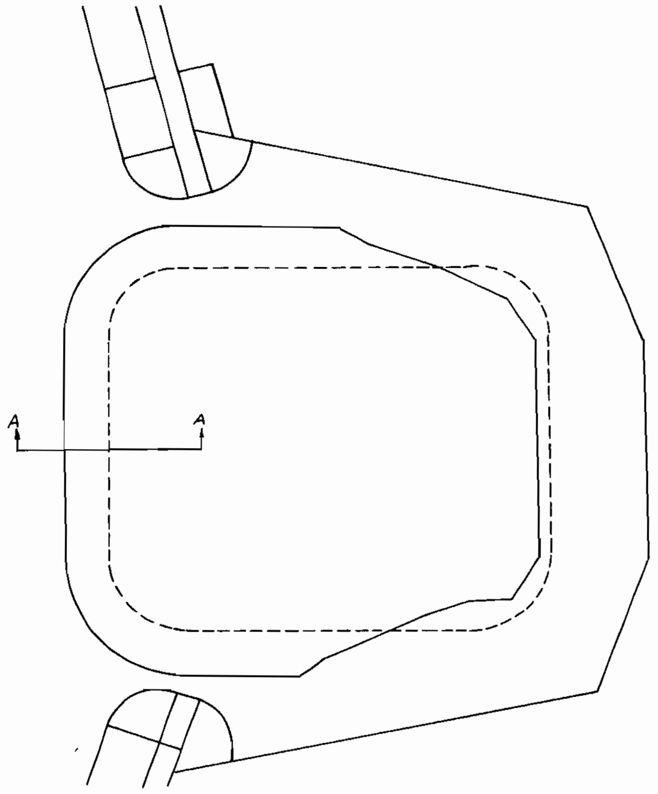
SUMMARY

Use F.S. = 1.25 Then $\frac{15'}{1.25} = 12'$, Use 12' Spacing Between Wellpoints

Headers Elevation: El. -4.0
Tip Elevation: El. -42.0
3 Ft. Screen with 5" Filter from El. -8.0 to El. -20.0
and from El. -32.0 to El. -42.0
1.5" Wellpoint

Reference TM 5-818-5 Nov. 1983

* Field Pumping Test DDM No. 8 Rigolets Lock 1969

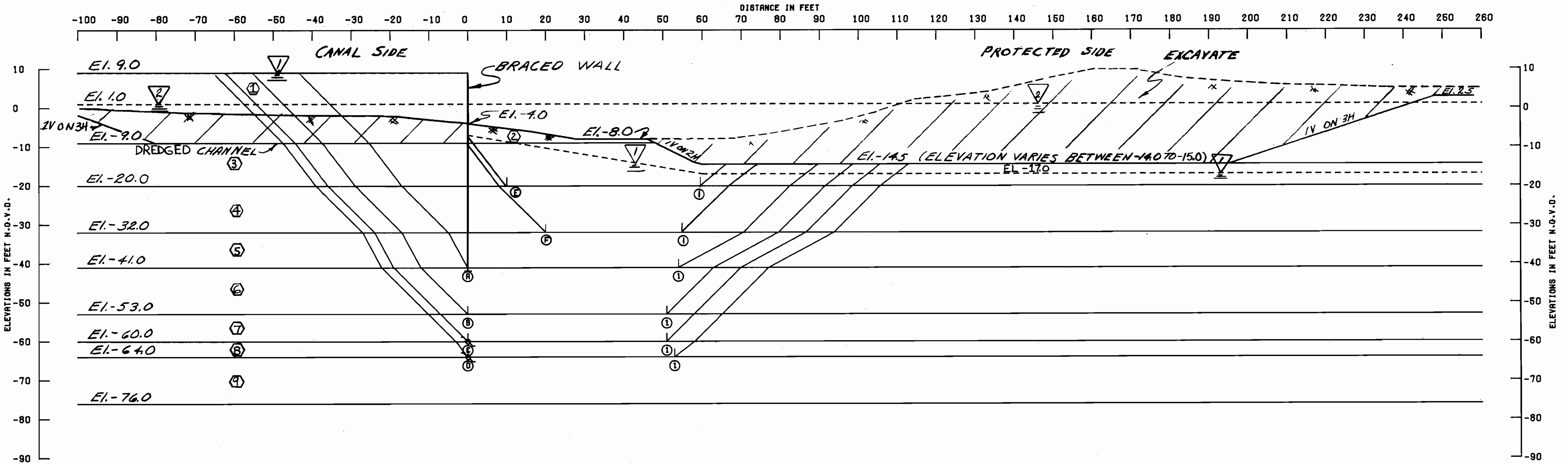


LAKE PONTCHARTRAIN, LA. AND VICINITY
HIGH LEVEL PLAN
DESIGN MEMORANDUM NO. 19 GENERAL DESIGN
ORLEANS AVENUE OUTFALL CANAL

DEWATERING SYSTEM

U. S. ARMY ENGINEER DISTRICT, NEW ORLEANS
CORPS OF ENGINEERS

JUNE 1988 FILE NO. H-2-30290



GENERAL NOTES:

CLASSIFICATION, STRATIFICATION, SHEAR STRENGTH, AND UNIT WEIGHT OF THE SOIL WERE BASED ON THE RESULTS OF UNDISTURBED BORINGS. SEE BORING DATA PLATE 40.

NOTE:
1-1 PH LINE IN STRATA 3 AND 5
2-2 PH LINE IN STRATUM 8

STRATUM NO.	SOIL TYPE	EFFECTIVE UNIT WT. P.C.F.		C - UNIT COHESION - P.S.F.				FRICTION ANGLE DEGREES
				CENTER OF STRATUM		BOTTOM OF STRATUM		
		VERT. 1	VERT. 2	VERT. 1	VERT. 2	VERT. 1	VERT. 2	
1	(WATER)	62.5	62.5	0.0	0.0	0.0	0.0	0.0
2	(CH)	100.0	100.0	200.0	200.0	200.0	200.0	0.0
3	(ML)	117.0	117.0	200.0	200.0	200.0	200.0	15.0
4	(CH)	98.0	98.0	300.0	300.0	300.0	300.0	0.0
5	(SP)	122.0	122.0	0.0	0.0	0.0	0.0	33.0
6	(CH)	106.0	106.0	600.0	600.0	600.0	600.0	0.0
7	(CH)	108.0	108.0	935.0	935.0	950.0	950.0	0.0
8	(ML)	117.0	117.0	200.0	200.0	200.0	200.0	15.0
9	(CH)	110.0	110.0	995.0	995.0	1020.0	1020.0	0.0

ASSUMED FAILURE SURFACE NO.	ELEV.	RESISTING FORCES R_A	R_B	R_P	DRIVING FORCES D_A	$-D_P$	SUMMATION OF FORCES RESISTING	DRIVING	FACTOR OF SAFETY
A 1	-41.0	20140	32400	36172	102795	38275	88712	64520	1.37
B 1	-53.0	34539	30600	50258	166657	82402	115397	84255	1.37
C 1	-60.0	47629	37298	63347	211008	114374	148274	96634	1.53
D 1	-64.0	53808	41622	69456	238799	134032	164886	104767	1.57
E 1	-20.0	7027	14700	3436	12438	1485	25163	10953	2.30
F 1	-32.0	11207	10500	10631	38158	16267	32338	21891	1.48

NOTES

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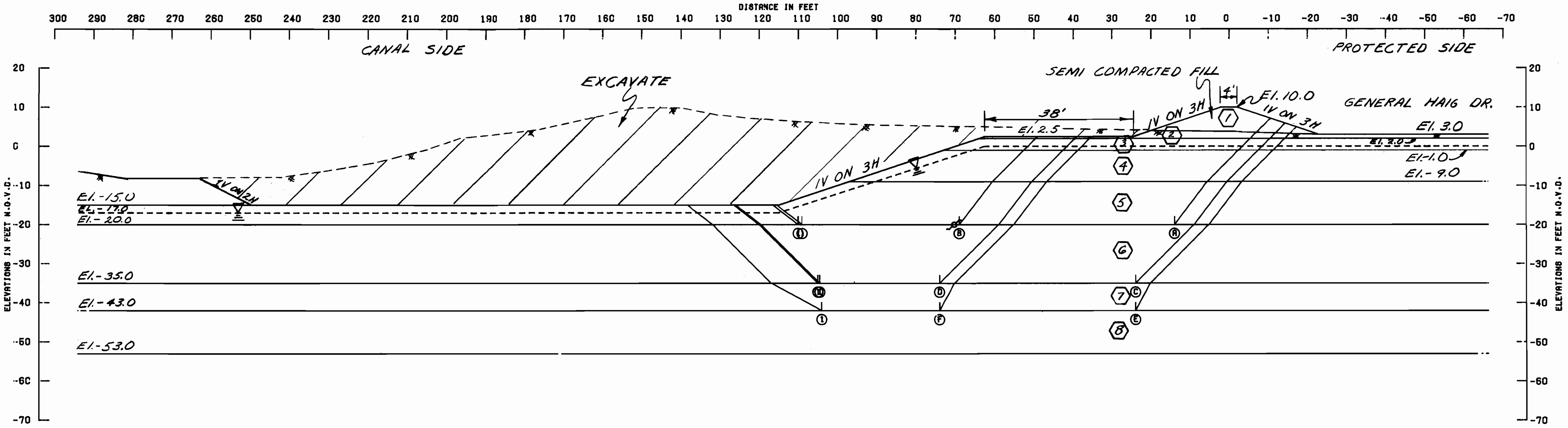
$$\text{FACTOR OF SAFETY} = \frac{R_A + R_B + R_P}{D_A - D_P}$$

LAKE PONTCHARTRAIN, LA. AND VICINITY
HIGH LEVEL PLAN
DESIGN MEMORANDUM NO. 19 GENERAL DESIGN
ORLEANS AVENUE OUTFALL CANAL

STABILITY ANALYSIS
SECTION A'-A'

U.S. ARMY ENGINEER DISTRICT, NEW ORLEANS
CORPS OF ENGINEERS
JUNE 1988 FILE NO. H-2-30290



STRATUM NO.	SOIL TYPE	EFFECTIVE UNIT WT. P.C.F.		C - UNIT COHESION - P.S.F.				FRICTION ANGLE DEGREES
				CENTER OF STRATUM		BOTTOM OF STRATUM		
		VERT. 1	VERT. 2	VERT. 1	VERT. 2	VERT. 1	VERT. 2	
1	(CH)	110.0	110.0	400.0	400.0	400.0	400.0	0.0
2	(CH)	115.0	115.0	700.0	700.0	700.0	700.0	0.0
3	(CH)	112.0	112.0	600.0	600.0	600.0	600.0	0.0
4	(CH)	103.0	103.0	280.0	280.0	280.0	280.0	0.0
5	(ML)	117.0	117.0	200.0	200.0	200.0	200.0	15.0
6	(CH)	102.0	102.0	500.0	500.0	500.0	500.0	0.0
7	(SP)	122.0	122.0	0.0	0.0	0.0	0.0	33.0
8	(CH)	106.0	106.0	750.0	750.0	750.0	750.0	0.0

ASSUMED FAILURE SURFACE			RESISTING FORCES			DRIVING FORCES		SUMMATION OF FORCES		FACTOR OF SAFETY
NO.		ELEV.	R_A	R_B	R_P	D_A	D_P	RESISTING	DRIVING	
A	1	-20.0	23298	44498	3680	44237	2001	71477	42236	1.69
B	1	-20.0	15342	17332	3587	26560	1836	37261	24724	1.51
C	1	-35.0	38005	40500	18431	98043	23661	96936	74382	1.30
D	1	-35.0	31473	15250	18431	74154	23861	65154	50293	1.30
E	1	-42.0	48130	60000	39695	131009	40786	147825	90223	1.64
F	1	-42.0	40802	22500	39695	104232	40786	102997	63446	1.62

GENERAL NOTES:

CLASSIFICATION, STRATIFICATION, SHEAR STRENGTH, AND UNIT WEIGHT OF THE SOIL WERE BASED ON THE RESULTS OF UNDISTURBED BORINGS. SEE BORING DATA PLATE 40

NOTES

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C -- UNIT COHESION, P.S.F.
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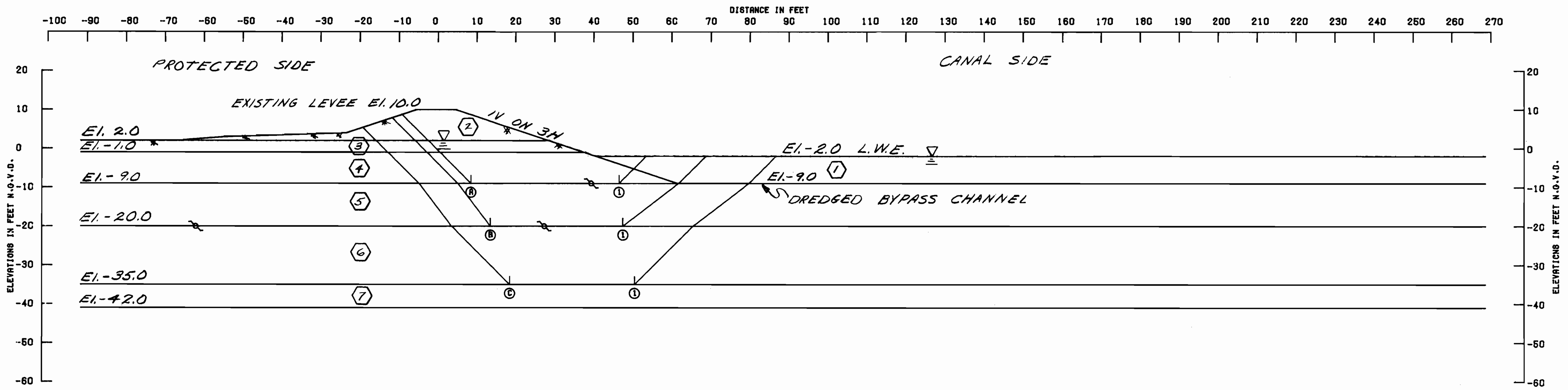
$$\text{FACTOR OF SAFETY} = \frac{R_A + R_B + R_P}{D_A - D_P}$$

LAKE PONTCHARTRAIN, LA. AND VICINITY
HIGH LEVEL PLAN
DESIGN MEMORANDUM NO. 19 GENERAL DESIGN
ORLEANS AVENUE OUTFALL CANAL
STABILITY ANALYSIS
SECTION B'-B'
U. S. ARMY ENGINEER DISTRICT, NEW ORLEANS
CORPS OF ENGINEERS
JUNE 1988
FILE NO H-2-30290



STRATUM NO.	SOIL TYPE	EFFECTIVE UNIT WT. P.C.F.		C - UNIT COHESION - P.S.F.				FRICTION ANGLE DEGREES
				CENTER OF STRATUM		BOTTOM OF STRATUM		
		VERT. 1	VERT. 2	VERT. 1	VERT. 2	VERT. 1	VERT. 2	
1	(WATER)	62.5	62.5	0.0	0.0	0.0	0.0	0.0
2	(CH)	115.0	115.0	700.0	700.0	700.0	700.0	0.0
3	(CH)	112.0	112.0	600.0	600.0	600.0	600.0	0.0
4	(CH)	103.0	103.0	280.0	280.0	280.0	280.0	0.0
5	(ML)	117.0	117.0	200.0	200.0	200.0	200.0	15.0
6	(CH)	102.0	102.0	500.0	500.0	500.0	500.0	0.0
7	(SP)	122.0	122.0	0.0	0.0	0.0	0.0	33.0

ASSUMED FAILURE SURFACE		RESISTING FORCES			DRIVING FORCES		SUMMATION OF FORCES		FACTOR OF SAFETY
NO.	ELEV.	R_A	R_B	R_P	D_A	$-D_P$	RESISTING	DRIVING	
A 1	-9.0	17531	10548	2099	19619	1911	30178	17708	1.70
B 1	-20.0	26527	15991	8745	47194	14437	51263	32757	1.56
C 1	-35.0	38858	16000	23037	103574	51580	77895	51994	1.50

GENERAL NOTES:

CLASSIFICATION, STRATIFICATION, SHEAR STRENGTH, AND UNIT WEIGHT OF THE SOIL WERE BASED ON THE RESULTS OF UNDISTURBED BORINGS. SEE BORING DATA PLATE 40

NOTES

- ϕ -- ANGLE OF INTERNAL FRICTION, DEGREES
- C -- UNIT COHESION, P.S.F.
- ∇ -- STATIC WATER SURFACE
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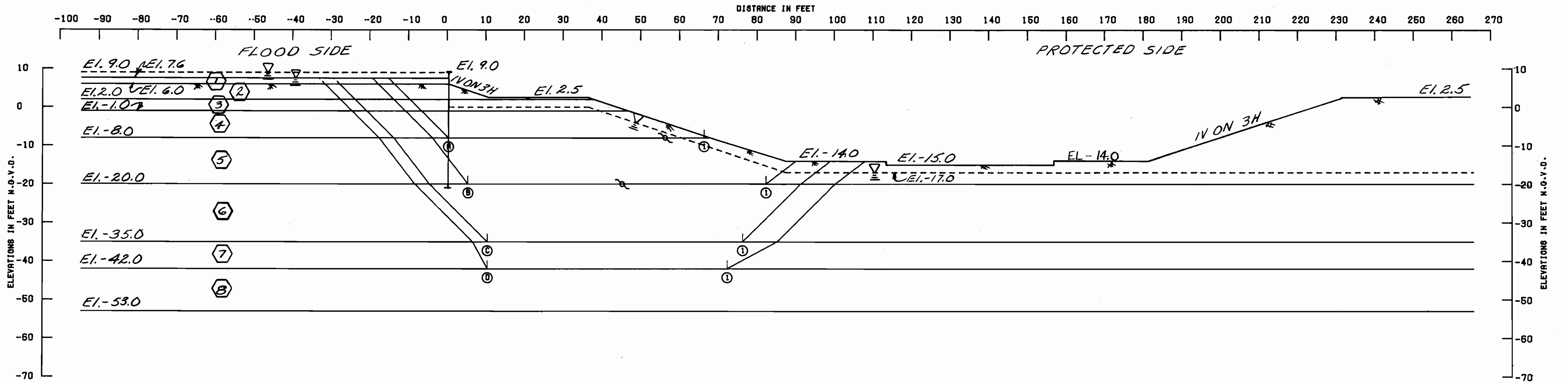
$$\text{FACTOR OF SAFETY} = \frac{R_A + R_B + R_P}{D_A - D_P}$$

LAKE PONTCHARTRAIN, LA. AND VICINITY
HIGH LEVEL PLAN
DESIGN MEMORANDUM NO. 19 GENERAL DESIGN
ORLEANS AVENUE OUTFALL CANAL

STABILITY ANALYSIS
DREDGED BYPASS CHANNEL

U.S. ARMY ENGINEER DISTRICT, NEW ORLEANS
CORPS OF ENGINEERS
JUNE 1988 FILE NO. H-2-30290



STRATUM NO.	SOIL TYPE	EFFECTIVE UNIT WT. P.C.F.		C - UNIT COHESION - P.S.F.				FRICTION ANGLE DEGREES
				CENTER OF STRATUM		BOTTOM OF STRATUM		
		VERT. 1	VERT. 2	VERT. 1	VERT. 2	VERT. 1	VERT. 2	
1	(WATER)	62.5	62.5	0.0	0.0	0.0	0.0	0.0
2	(CH)	115.0	115.0	700.0	700.0	700.0	700.0	0.0
3	(CH)	112.0	112.0	600.0	600.0	600.0	600.0	0.0
4	(CH)	103.0	103.0	280.0	280.0	280.0	280.0	0.0
5	(ML)	117.0	117.0	200.0	200.0	200.0	200.0	15.0
6	(CH)	102.0	102.0	500.0	500.0	500.0	500.0	0.0
7	(SP)	122.0	122.0	0.0	0.0	0.0	0.0	33.0
8	(CH)	106.0	106.0	750.0	750.0	750.0	750.0	0.0

ASSUMED FAILURE SURFACE		RESISTING FORCES			DRIVING FORCES		SUMMATION OF FORCES		FACTOR OF SAFETY
NO.	ELEV.	R_A	R_B	R_P	D_A	$-D_P$	RESISTING	DRIVING	
A 1	-8.0	13120	18132	209	12245	10	31461	12235	2.57
B 1	-20.0	21993	35920	4528	38751	2450	62441	36301	1.72
C 1	-35.0	36112	33000	19368	93821	26265	88480	67556	1.31
D 1	-42.0	46782	46500	43533	127331	44885	136815	82446	1.66

GENERAL NOTES:

CLASSIFICATION, STRATIFICATION, SHEAR STRENGTH, AND UNIT WEIGHT OF THE SOIL WERE BASED ON THE RESULTS OF UNDISTURBED BORINGS. SEE BORING DATA PLATE 40.

NOTES

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$$\text{FACTOR OF SAFETY} = \frac{R_A + R_B + R_P}{D_A - D_P}$$

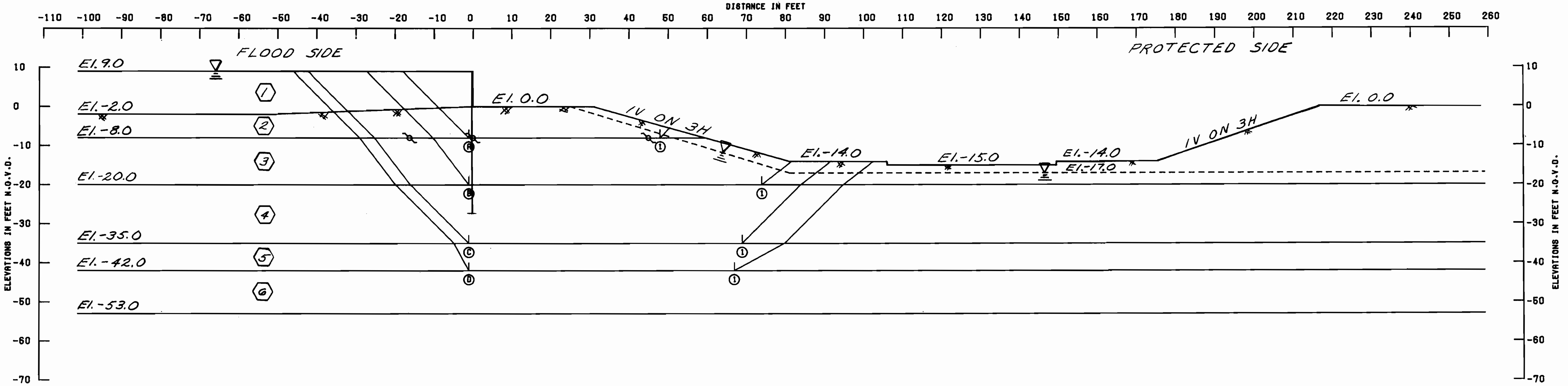
LAKE PONTCHARTRAIN, LA AND VICINITY
HIGH LEVEL PLAN

DESIGN MEMORANDUM NO. 19 GENERAL DESIGN

ORLEANS AVENUE OUTFALL CANAL

STABILITY ANALYSIS
SECTION C'-C'

U.S. ARMY ENGINEER DISTRICT NEW ORLEANS
CORPS OF ENGINEERS
JUNE 1988 FILE NO H-2-30290



STRATUM NO.	SOIL TYPE	EFFECTIVE UNIT WT. P.C.F.		C - UNIT COHESION - P.S.F.				FRICTION ANGLE DEGREES
				CENTER OF STRATUM		BOTTOM OF STRATUM		
		VERT. 1	VERT. 2	VERT. 1	VERT. 2	VERT. 1	VERT. 2	
1	(WATER)	62.5	62.5	0.0	0.0	0.0	0.0	0.0
2	(CH)	103.0	103.0	280.0	280.0	280.0	280.0	0.0
3	(ML)	117.0	117.0	200.0	200.0	200.0	200.0	15.0
4	(CH)	102.0	102.0	500.0	500.0	500.0	500.0	0.0
5	(SP)	122.0	122.0	0.0	0.0	0.0	0.0	33.0
6	(CH)	106.0	106.0	750.0	750.0	750.0	750.0	0.0

ASSUMED FAILURE SURFACE		RESISTING FORCES			DRIVING FORCES		SUMMATION OF FORCES		FACTOR OF SAFETY
NO.	ELEV.	R_A	R_B	R_P	D_A	$-D_P$	RESISTING	DRIVING	
A 1	-8.0	4294	13707	1408	10261	417	19409	9844	1.97
B 1	-20.0	10953	33482	4690	35108	2719	49125	32389	1.52
C 1	-35.0	25528	35000	19370	87797	26441	79898	61356	1.30
D 1	-42.0	34175	51000	43085	120796	44385	128260	76411	1.68

GENERAL NOTES:

CLASSIFICATION, STRATIFICATION, SHEAR STRENGTH, AND UNIT WEIGHT OF THE SOIL WERE BASED ON THE RESULTS OF UNDISTURBED BORINGS. SEE BORING DATA PLATE 40.

NOTES

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C -- UNIT COHESION, P.S.F.
∇ -- STATIC WATER SURFACE
D -- HORIZONTAL DRIVING FORCE IN POUNDS
R -- HORIZONTAL RESISTING FORCE IN POUNDS
A -- AS A SUBSCRIPT, REFERS TO ACTIVE WEDGE
B -- AS A SUBSCRIPT, REFERS TO CENTRAL BLOCK
P -- AS A SUBSCRIPT, REFERS TO PASSIVE WEDGE

$$\text{FACTOR OF SAFETY} = \frac{R_A + R_B + R_P}{D_A - D_P}$$

LAKE PONTCHARTRAIN, LA AND VICINITY
HIGH LEVEL PLAN

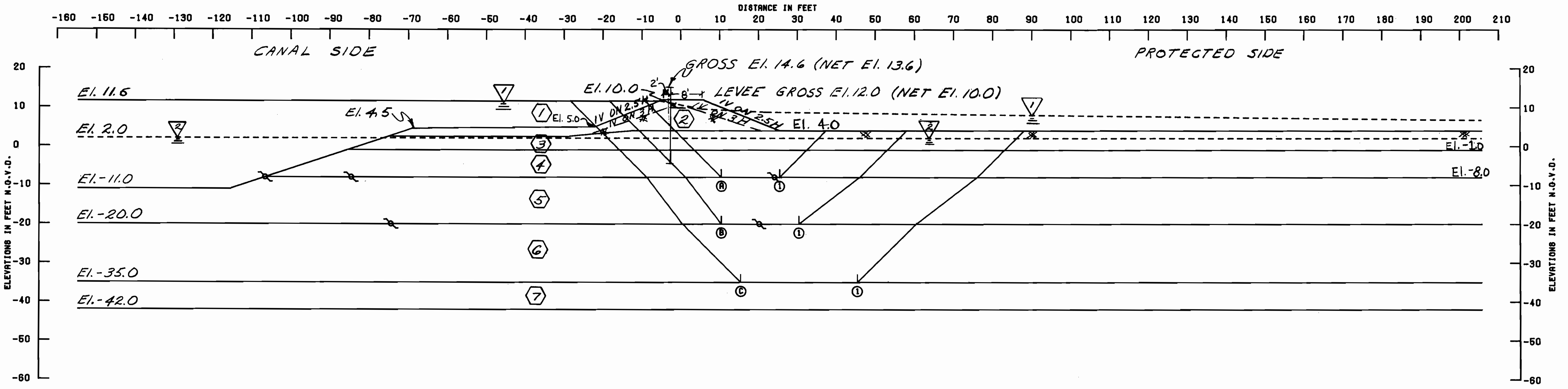
DESIGN MEMORANDUM NO. 19 GENERAL DESIGN

ORLEANS AVENUE OUTFALL CANAL

STABILITY ANALYSIS
SECTION D'-D'

U.S. ARMY ENGINEER DISTRICT, NEW ORLEANS
CORPS OF ENGINEERS

JUNE 1988 FILE NO. H-2-30290



NOTE:
1 — 1 PH LINE IN STRATUM 5
2 — 2 PH LINE IN STRATUM 7

STRATUM NO.	SOIL TYPE	EFFECTIVE UNIT WT. P.C.F.		C - UNIT COHESION - P.S.F.				FRICTION ANGLE DEGREES
				CENTER OF STRATUM		BOTTOM OF STRATUM		
		VERT. 1	VERT. 2	VERT. 1	VERT. 2	VERT. 1	VERT. 2	
1	(WATER)	62.5	62.5	0.0	0.0	0.0	0.0	0.0
2	(CH)	110.0	110.0	400.0	400.0	400.0	400.0	0.0
3	(CH)	112.0	112.0	600.0	600.0	600.0	600.0	0.0
4	(CH)	103.0	103.0	280.0	280.0	280.0	280.0	0.0
5	(ML)	117.0	117.0	200.0	200.0	200.0	200.0	15.0
6	(CH)	102.0	102.0	500.0	500.0	500.0	500.0	0.0
7	(SP)	122.0	122.0	0.0	0.0	0.0	0.0	33.0

ASSUMED FAILURE SURFACE		RESISTING FORCES			DRIVING FORCES		SUMMATION OF FORCES		FACTOR OF SAFETY
NO.	ELEV.	R_A	R_B	R_P	D_A	$-D_P$	RESISTING	DRIVING	
A 1	-8.0	15179	4189	9920	21093	7843	29288	13250	2.21
B 1	-20.0	23255	9540	20999	53852	31639	53794	22213	2.42
C 1	-35.0	35476	15000	36173	114376	83387	86649	30989	2.80

GENERAL NOTES:

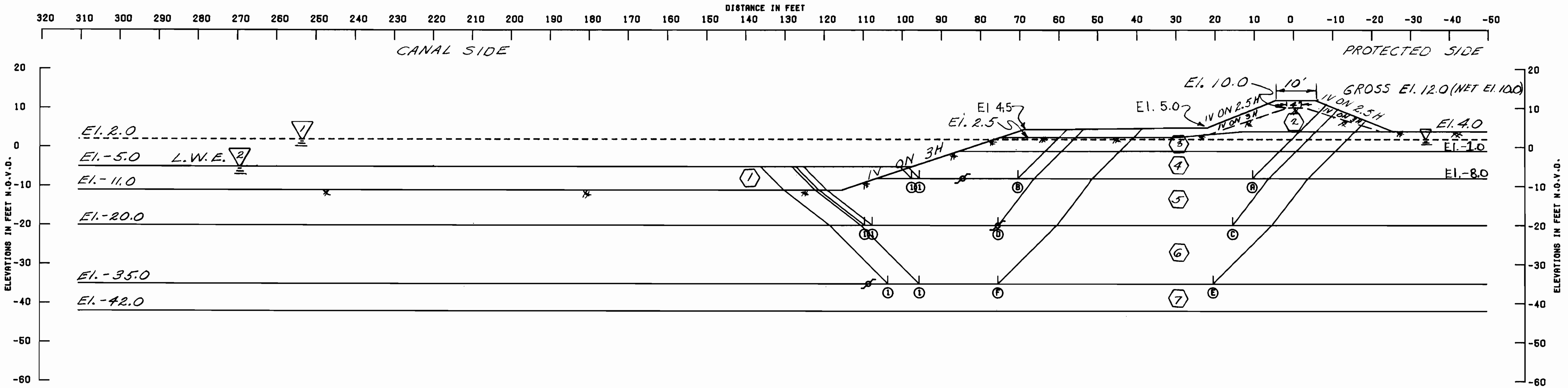
CLASSIFICATION, STRATIFICATION, SHEAR STRENGTH, AND UNIT WEIGHT OF THE SOIL WERE BASED ON THE RESULTS OF UNDISTURBED BORINGS. SEE BORING DATA PLATE 40.

NOTES

Φ -- ANGLE OF INTERNAL FRICTION, DEGREES
C -- UNIT COHESION, P.S.F.
∇ -- STATIC WATER SURFACE
D -- HORIZONTAL DRIVING FORCE IN POUNDS
R -- HORIZONTAL RESISTING FORCE IN POUNDS
A -- AS A SUBSCRIPT, REFERS TO ACTIVE WEDGE
B -- AS A SUBSCRIPT, REFERS TO CENTRAL BLOCK
P -- AS A SUBSCRIPT, REFERS TO PASSIVE WEDGE

$$\text{FACTOR OF SAFETY} = \frac{R_A + R_B + R_P}{D_A - D_P}$$

LAKE PONTCHARTRAIN, LA. AND VICINITY
HIGH LEVEL PLAN
DESIGN MEMORANDUM NO. 19 GENERAL DESIGN
ORLEANS AVENUE OUTFALL CANAL
STABILITY ANALYSIS
SECTION C-C
U.S. ARMY ENGINEER DISTRICT, NEW ORLEANS
CORPS OF ENGINEERS
JUNE 1988 FILE NO. H-2-30290



NOTE:

1 — 1 PH LINE IN STRATUM 7

2 — 2 PH LINE IN STRATUM 5

STRATUM NO.	SOIL TYPE	EFFECTIVE UNIT WT. P.C.F.		C - UNIT COHESION - P.S.F.				FRICTION ANGLE DEGREES
				CENTER OF STRATUM		BOTTOM OF STRATUM		
		VERT. 1	VERT. 2	VERT. 1	VERT. 2	VERT. 1	VERT. 2	
1	(WATER)	62.5	62.5	0.0	0.0	0.0	0.0	0.0
2	(CH)	110.0	110.0	400.0	400.0	400.0	400.0	0.0
3	(CH)	112.0	112.0	600.0	600.0	600.0	600.0	0.0
4	(CH)	103.0	103.0	280.0	280.0	280.0	280.0	0.0
5	(ML)	117.0	117.0	200.0	200.0	200.0	200.0	15.0
6	(CH)	102.0	102.0	500.0	500.0	500.0	500.0	0.0
7	(SP)	122.0	122.0	0.0	0.0	0.0	0.0	33.0

ASSUMED FAILURE SURFACE		RESISTING FORCES			DRIVING FORCES		SUMMATION OF FORCES		FACTOR OF SAFETY
NO.	ELEV.	R_A	R_B	R_P	D_A	$-D_P$	RESISTING	DRIVING	
A 1	-8.0	15406	23576	1539	20876	527	40521	20349	1.99
B 1	-8.0	9814	7249	1259	8510	418	18322	8092	2.26
C 1	-20.0	25929	41381	5169	51765	9684	72479	42081	1.72
D 1	-20.0	18226	11878	5033	32025	9489	35137	22536	1.56
E 1	-35.0	40023	37500	19980	110368	45470	97503	64898	1.50
F 1	-35.0	33845	14000	19858	85233	43418	67703	41815	1.62

GENERAL NOTES:

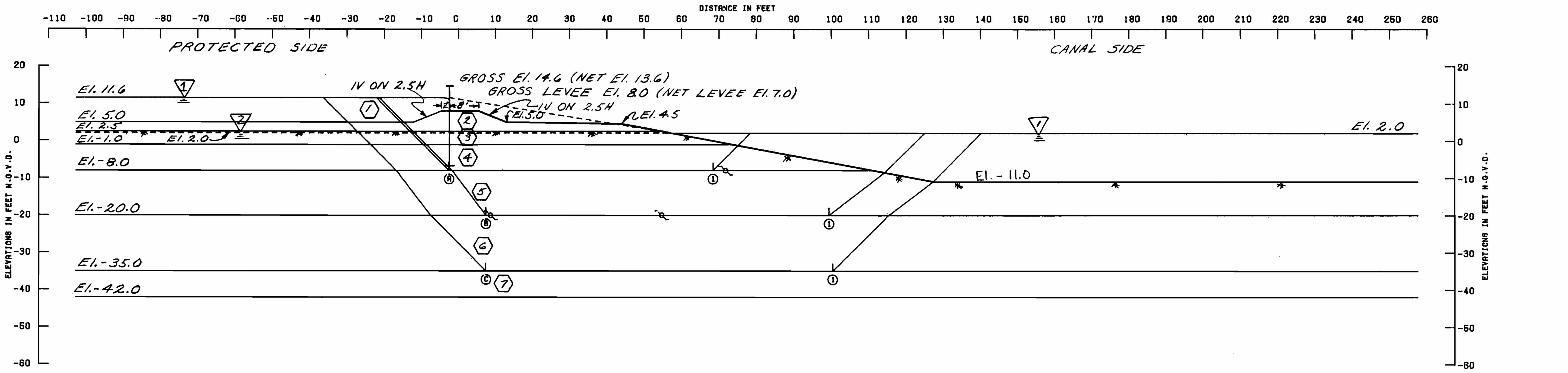
CLASSIFICATION, STRATIFICATION, SHEAR STRENGTH, AND UNIT WEIGHT OF THE SOIL WERE BASED ON THE RESULTS OF UNDISTURBED BORINGS. SEE BORING DATA PLATE 40

NOTES

ϕ -- ANGLE OF INTERNAL FRICTION, DEGREES
C -- UNIT COHESION, P.S.F.
▽ -- STATIC WATER SURFACE
D -- HORIZONTAL DRIVING FORCE IN POUNDS
R -- HORIZONTAL RESISTING FORCE IN POUNDS
A -- AS A SUBSCRIPT, REFERS TO ACTIVE WEDGE
B -- AS A SUBSCRIPT, REFERS TO CENTRAL BLOCK
P -- AS A SUBSCRIPT, REFERS TO PASSIVE WEDGE

FACTOR OF SAFETY = $\frac{R_A + R_B + R_P}{D_A - D_P}$

LAKE PONTCHARTRAIN, LA. AND VICINITY
HIGH LEVEL PLAN
DESIGN MEMORANDUM NO.19 GENERAL DESIGN
ORLEANS AVENUE OUTFALL CANAL
STABILITY ANALYSIS
SECTION D-D
U.S. ARMY ENGINEER DISTRICT, NEW ORLEANS
CORPS OF ENGINEERS
JUNE 1988
FILE NO. H-2-30290



NOTE:
1 — 1 PH LINE IN STRATUM 5
2 — 3 PH LINE IN STRATUM 7

STRATUM NO.	SOIL TYPE	EFFECTIVE UNIT WT. P.C.F.		C - UNIT COHESION - P.S.F.				FRICTION ANGLE DEGREES
				CENTER OF STRATUM		BOTTOM OF STRATUM		
		VERT. 1	VERT. 2	VERT. 1	VERT. 2	VERT. 1	VERT. 2	
1	(WATER)	62.5	62.5	0.0	0.0	0.0	0.0	0.0
2	(CH)	110.0	110.0	400.0	400.0	400.0	400.0	0.0
3	(CH)	112.0	112.0	600.0	600.0	600.0	600.0	0.0
4	(CH)	103.0	103.0	280.0	280.0	280.0	280.0	0.0
5	(ML)	117.0	117.0	200.0	200.0	200.0	200.0	15.0
6	(CH)	102.0	102.0	500.0	500.0	500.0	500.0	0.0
7	(SP)	122.0	122.0	0.0	0.0	0.0	0.0	33.0

ASSUMED FAILURE SURFACE			RESISTING FORCES			DRIVING FORCES		SUMMATION OF FORCES		FACTOR OF SAFETY
NO.		ELEV.	R_A	R_B	R_P	D_A	$-D_P$	RESISTING	DRIVING	
A	1	-8.0	10123	19880	3745	16587	4220	33748	12367	2.73
B	1	-20.0	18098	42906	8907	45458	19418	69911	26040	2.69
C	1	-35.0	33362	46500	21648	105206	60173	101510	45033	2.25

GENERAL NOTES:

CLASSIFICATION, STRATIFICATION, SHEAR STRENGTH, AND UNIT WEIGHT OF THE SOIL WERE BASED ON THE RESULTS OF UNDISTURBED BORINGS. SEE BORING DATA PLATE 40

NOTES

Φ --- ANGLE OF INTERNAL FRICTION, DEGREES
C -- UNIT COHESION, P.S.F.
∇ --- STATIC WATER SURFACE
D --- HORIZONTAL DRIVING FORCE IN POUNDS
R -- HORIZONTAL RESISTING FORCE IN POUNDS
A -- AS A SUBSCRIPT, REFERS TO ACTIVE WEDGE
B -- AS A SUBSCRIPT, REFERS TO CENTRAL BLOCK
P --- AS A SUBSCRIPT, REFERS TO PASSIVE WEDGE

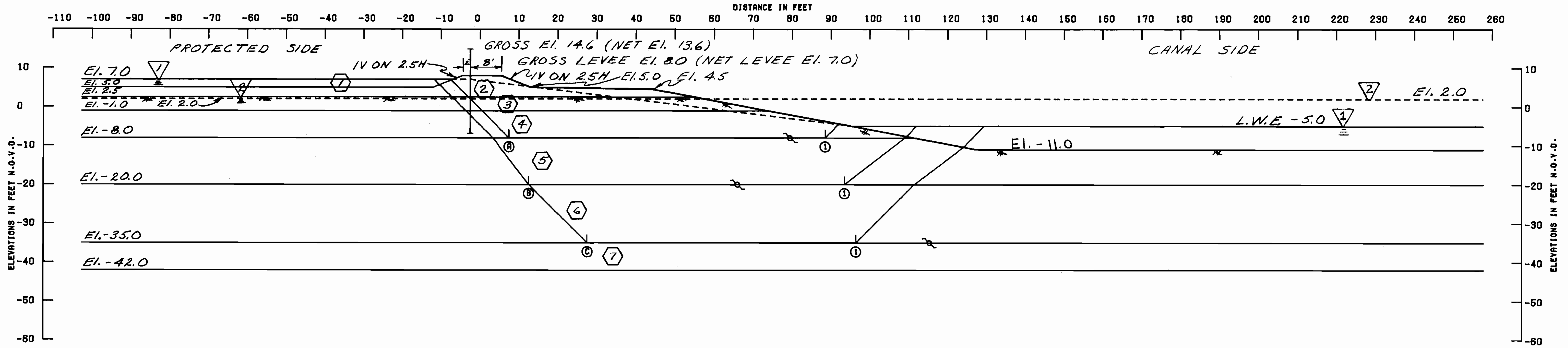
$$\text{FACTOR OF SAFETY} = \frac{R_A + R_B + R_P}{D_A - D_P}$$

LAKE PONTCHARTRAIN, LA AND VICINITY
HIGH LEVEL PLAN
DESIGN MEMORANDUM NO. 19 GENERAL DESIGN

ORLEANS AVENUE OUTFALL CANAL

STABILITY ANALYSIS
SECTION F-F

U.S. ARMY ENGINEER DISTRICT, NEW ORLEANS
CORPS OF ENGINEERS
JUNE 1988 FILE NO. H-2-30290



NOTE: ①-① PH LINE IN STRATUM 5
②-② PH LINE IN STRATUM 7

STRATUM NO.	SOIL TYPE	EFFECTIVE UNIT WT. P.C.F.		C - UNIT COHESION - P.S.F.				FRICTION ANGLE DEGREES
				CENTER OF STRATUM		BOTTOM OF STRATUM		
		VERT. 1	VERT. 2	VERT. 1	VERT. 2	VERT. 1	VERT. 2	
1	(WATER)	62.5	62.5	0.0	0.0	0.0	0.0	0.0
2	(CH)	110.0	110.0	400.0	400.0	400.0	400.0	0.0
3	(CH)	112.0	112.0	600.0	600.0	600.0	600.0	0.0
4	(CH)	103.0	103.0	280.0	280.0	280.0	280.0	0.0
5	(ML)	117.0	117.0	200.0	200.0	200.0	200.0	15.0
6	(CH)	102.0	102.0	500.0	500.0	500.0	500.0	0.0
7	(SP)	122.0	122.0	0.0	0.0	0.0	0.0	33.0

ASSUMED FAILURE SURFACE		RESISTING FORCES			DRIVING FORCES		SUMMATION OF FORCES		FACTOR OF SAFETY
NO.	ELEV.	R_A	R_B	R_P	D_A	$-D_P$	RESISTING	DRIVING	
A 1	-8.0	11608	22560	2024	13631	795	36192	12836	2.82
B 1	-20.0	19608	39266	9799	40741	11902	68673	28839	2.38
C 1	-35.0	34608	34500	22229	93913	46384	91337	47529	1.92

GENERAL NOTES:

CLASSIFICATION, STRATIFICATION, SHEAR STRENGTH, AND UNIT WEIGHT OF THE SOIL WERE BASED ON THE RESULTS OF UNDISTURBED BORINGS. SEE BORING DATA PLATE 40

NOTES

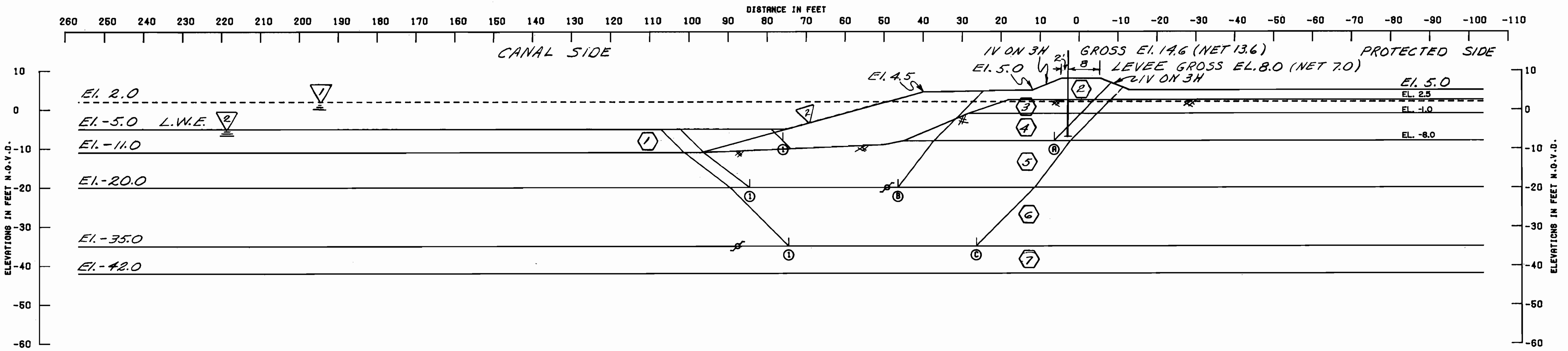
ϕ -- ANGLE OF INTERNAL FRICTION, DEGREES
C -- UNIT COHESION, P.S.F.
▽ -- STATIC WATER SURFACE
D -- HORIZONTAL DRIVING FORCE IN POUNDS
R -- HORIZONTAL RESISTING FORCE IN POUNDS
A -- AS A SUBSCRIPT, REFERS TO ACTIVE WEDGE
B -- AS A SUBSCRIPT, REFERS TO CENTRAL BLOCK
P -- AS A SUBSCRIPT, REFERS TO PASSIVE WEDGE

$$\text{FACTOR OF SAFETY} = \frac{R_A + R_B + R_P}{D_A - D_P}$$

LAKE PONTCHARTRAIN, LA. AND VICINITY
HIGH LEVEL PLAN
DESIGN MEMORANDUM NO. 19 GENERAL DESIGN
ORLEANS AVENUE OUTFALL CANAL

STABILITY ANALYSIS
SECTION G-G

U.S. ARMY ENGINEER DISTRICT, NEW ORLEANS
CORPS OF ENGINEERS
JUNE 1988 FILE NO. H-2-30290



NOTE:
1 — 1 PH LINE STRATUM 7
2 — 2 PH LINE STRATUM 5

STRATUM NO.	SOIL TYPE	EFFECTIVE UNIT WT. P.C.F.		C - UNIT COHESION - P.S.F.				FRICTION ANGLE DEGREES
				CENTER OF STRATUM		BOTTOM OF STRATUM		
		VERT. 1	VERT. 2	VERT. 1	VERT. 2	VERT. 1	VERT. 2	
1	(WATER)	62.5	62.5	0.0	0.0	0.0	0.0	0.0
2	(CH)	110.0	110.0	400.0	400.0	400.0	400.0	0.0
3	(CH)	112.0	112.0	600.0	600.0	600.0	600.0	0.0
4	(CH)	103.0	103.0	280.0	280.0	280.0	280.0	0.0
5	(ML)	117.0	117.0	200.0	200.0	200.0	200.0	15.0
6	(CH)	102.0	102.0	500.0	500.0	500.0	500.0	0.0
7	(SP)	122.0	122.0	0.0	0.0	0.0	0.0	33.0

ASSUMED FAILURE SURFACE		RESISTING FORCES			DRIVING FORCES		SUMMATION OF FORCES		FACTOR OF SAFETY
NO.	ELEV.	R_A	R_B	R_P	D_A	$-D_P$	RESISTING	DRIVING	
A 1	-8.0	11607	23180	2198	13628	396	36985	13232	2.79
B 1	-20.0	17474	16805	6908	32742	10030	41187	22712	1.81
C 1	-35.0	35757	24000	21433	93671	45401	81190	48270	1.68

GENERAL NOTES:

CLASSIFICATION, STRATIFICATION, SHEAR STRENGTH, AND UNIT WEIGHT OF THE SOIL WERE BASED ON THE RESULTS OF UNDISTURBED BORINGS. SEE BORING DATA PLATE 40

NOTES

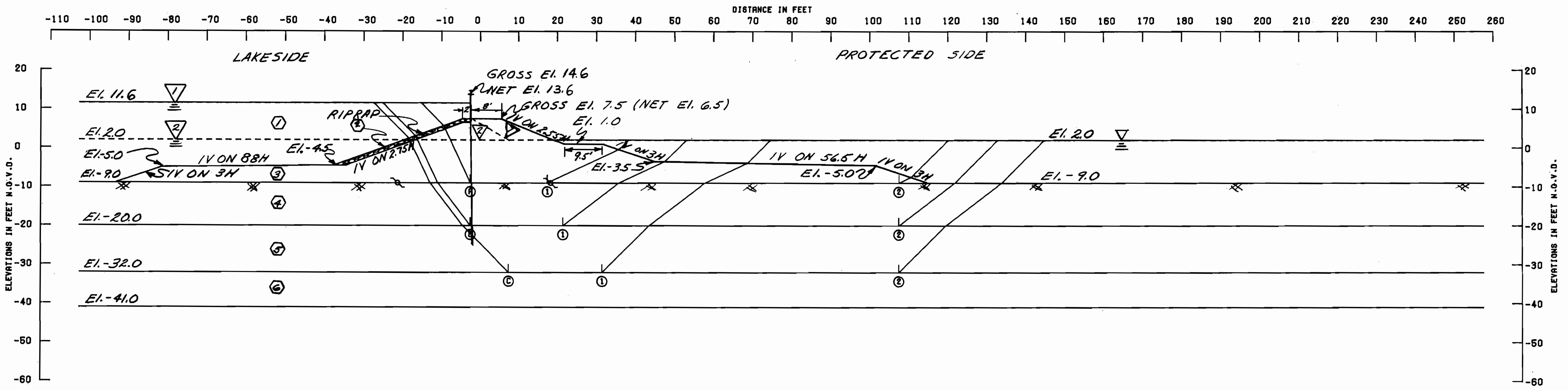
ϕ -- ANGLE OF INTERNAL FRICTION, DEGREES
C -- UNIT COHESION, P.S.F.
∇ -- STATIC WATER SURFACE
D -- HORIZONTAL DRIVING FORCE IN POUNDS
R -- HORIZONTAL RESISTING FORCE IN POUNDS
A -- AS A SUBSCRIPT, REFERS TO ACTIVE WEDGE
B -- AS A SUBSCRIPT, REFERS TO CENTRAL BLOCK
P -- AS A SUBSCRIPT, REFERS TO PASSIVE WEDGE

$$\text{FACTOR OF SAFETY} = \frac{R_A + R_B + R_P}{D_A - D_P}$$

LAKE PONTCHARTRAIN, LA. AND VICINITY
HIGH LEVEL PLAN
DESIGN MEMORANDUM NO. 19 GENERAL DESIGN
ORLEANS AVENUE OUTFALL CANAL

STABILITY ANALYSIS
SECTION H-H

U.S. ARMY ENGINEER DISTRICT, NEW ORLEANS
CORPS OF ENGINEERS
JUNE 1988
FILE NO. H-2-30290



NOTE: ▽1—▽1 PH LINE IN STRATA 2, 3 AND 4
▽2—▽2 PH LINE IN STRATUM 6

STRATUM NO.	SOIL TYPE	EFFECTIVE UNIT WT. P.C.F.		C - UNIT COHESION - P.S.F.				FRICTION ANGLE DEGREES
				CENTER OF STRATUM		BOTTOM OF STRATUM		
		VERT. 1	VERT. 2	VERT. 1	VERT. 2	VERT. 1	VERT. 2	
1	(WATER)	62.5	62.5	0.0	0.0	0.0	0.0	0.0
2	(RIPRAP)	132.0	132.0	0.0	0.0	0.0	0.0	40.0
3	(SI)	92.0	92.0	0.0	0.0	0.0	0.0	40.0
4	(ML)	117.0	117.0	200.0	200.0	200.0	200.0	15.0
5	(CH)	98.0	98.0	300.0	300.0	300.0	300.0	0.0
6	(SP)	122.0	122.0	0.0	0.0	0.0	0.0	33.0

ASSUMED FAILURE SURFACE		RESISTING FORCES			DRIVING FORCES		SUMMATION OF FORCES		FACTOR OF SAFETY
NO.	ELEV.	R_A	R_B	R_P	D_A	$-D_P$	RESISTING	DRIVING	
A 1	-9.0	3335	7268	5259	17395	5243	15862	12152	1.31
A 2	-9.0	3335	20935	193	17395	3835	24463	13560	1.80
B 1	-20.0	12033	7200	12549	42814	22234	31782	20580	1.54
B 2	-20.0	12033	33000	8185	42814	18634	53218	24180	2.20
C 1	-32.0	18935	7200	17887	83588	54157	44022	29431	1.50
C 2	-32.0	18935	30000	15237	83588	49447	64172	34141	1.88

GENERAL NOTES:

CLASSIFICATION, STRATIFICATION, SHEAR STRENGTH, AND UNIT WEIGHT OF THE SOIL WERE BASED ON THE RESULTS OF UNDISTURBED BORINGS. SEE BORING DATA PLATE 40.

NOTES

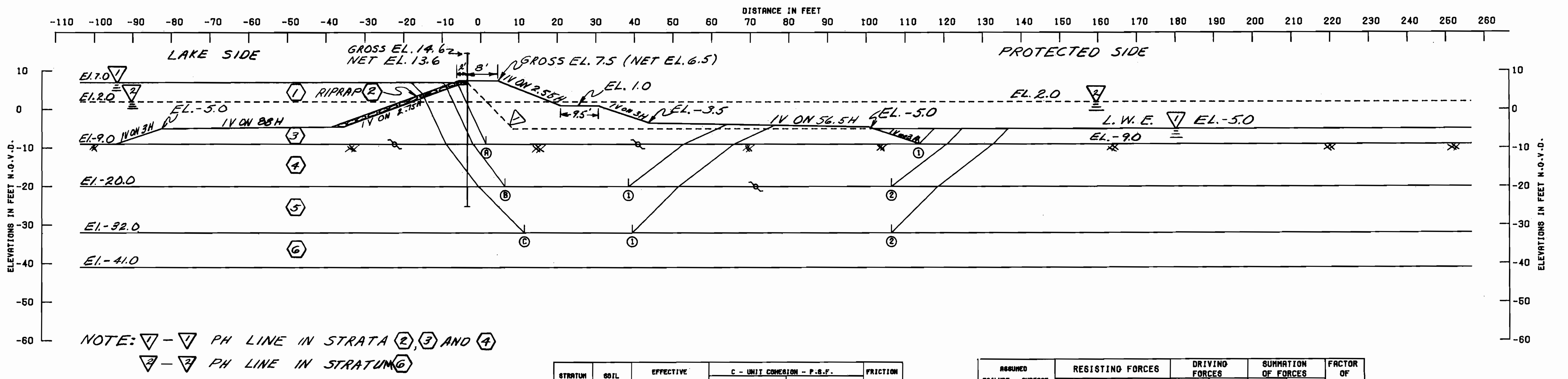
- Φ -- ANGLE OF INTERNAL FRICTION, DEGREES
- C -- UNIT COHESION, P.S.F.
- $\underline{\nabla}$ -- STATIC WATER SURFACE
- D -- HORIZONTAL DRIVING FORCE IN POUNDS
- R -- HORIZONTAL RESISTING FORCE IN POUNDS
- A -- AS A SUBSCRIPT, REFERS TO ACTIVE WEDGE
- B -- AS A SUBSCRIPT, REFERS TO CENTRAL BLOCK
- P -- AS A SUBSCRIPT, REFERS TO PASSIVE WEDGE

$$\text{FACTOR OF SAFETY} = \frac{R_A + R_B + R_P}{D_A - D_P}$$

LAKE PONTCHARTRAIN, LA. AND VICINITY
HIGH LEVEL PLAN
DESIGN MEMORANDUM NO. 19 GENERAL DESIGN
ORLEANS AVENUE OUTFALL CANAL

STABILITY ANALYSIS
SECTION I-I

U.S. ARMY ENGINEER DISTRICT NEW ORLEANS
CORPS OF ENGINEERS
JUNE 1988 FILE NO. H-2-30290



STRATUM NO.	SOIL TYPE	EFFECTIVE UNIT WT. P.C.F.		C - UNIT COHESION - P.S.F.				FRICTION ANGLE DEGREES
				CENTER OF STRATUM		BOTTOM OF STRATUM		
		VERT. 1	VERT. 2	VERT. 1	VERT. 2	VERT. 1	VERT. 2	
1	(WATER)	62.5	62.5	0.0	0.0	0.0	0.0	0.0
2	(RIPRAP)	132.0	132.0	0.0	0.0	0.0	0.0	40.0
3	(SI)	92.0	92.0	0.0	0.0	0.0	0.0	40.0
4	(ML)	117.0	117.0	200.0	200.0	200.0	200.0	15.0
5	(CH)	98.0	98.0	300.0	300.0	300.0	300.0	0.0
6	(SP)	122.0	122.0	0.0	0.0	0.0	0.0	33.0

ASSUMED FAILURE SURFACE		RESISTING FORCES			DRIVING FORCES		SUMMATION OF FORCES		FACTOR OF SAFETY
NO.	ELEV.	R_A	R_B	R_P	D_A	$-D_P$	RESISTING	DRIVING	
A 1	-9.0	5576	27408	1	12710	500	32985	12210	2.70
B 1	-20.0	13316	9600	11290	36290	14216	34206	22074	1.55
B 2	-20.0	13316	29648	6504	36290	10540	49468	25750	1.92
C 1	-32.0	18175	8400	17707	75185	42374	44282	32811	1.35
C 2	-32.0	18175	28500	13556	75185	36104	60231	39081	1.54

GENERAL NOTES:

CLASSIFICATION, STRATIFICATION, SHEAR STRENGTH, AND UNIT WEIGHT OF THE SOIL WERE BASED ON THE RESULTS OF UNDISTURBED BORINGS. SEE BORING DATA PLATE 40

NOTES

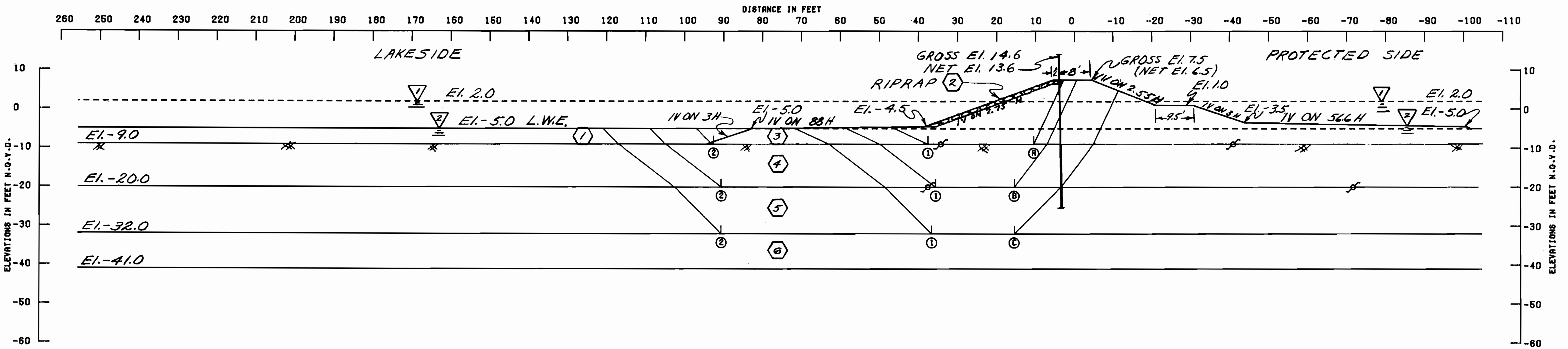
ϕ -- ANGLE OF INTERNAL FRICTION, DEGREES
C -- UNIT COHESION, P.S.F.
▽ -- STATIC WATER SURFACE
D -- HORIZONTAL DRIVING FORCE IN POUNDS
R -- HORIZONTAL RESISTING FORCE IN POUNDS
A -- AS A SUBSCRIPT, REFERS TO ACTIVE WEDGE
B -- AS A SUBSCRIPT, REFERS TO CENTRAL BLOCK
P -- AS A SUBSCRIPT, REFERS TO PASSIVE WEDGE

$$\text{FACTOR OF SAFETY} = \frac{R_A + R_B + R_P}{D_A - D_P}$$

LAKE PONTCHARTRAIN, LA. AND VICINITY
HIGH LEVEL PLAN
DESIGN MEMORANDUM NO. 19 GENERAL DESIGN
ORLEANS AVENUE OUTFALL CANAL

STABILITY ANALYSIS
SECTION J-J

U S. ARMY ENGINEER DISTRICT, NEW ORLEANS
CORPS OF ENGINEERS
JUNE 1988 FILE NO. H-2-30290



NOTE: ▽1 – ▽1 PH LINE IN STRATUM 6
▽2 – ▽2 PH LINE IN STRATA 2, 3, AND 4

STRATUM NO.	SOIL TYPE	EFFECTIVE UNIT WT. P.C.F. VERT. 1	EFFECTIVE UNIT WT. P.C.F. VERT. 2	C - UNIT COHESION - P.S.F. CENTER OF STRATUM VERT. 1	CENTER OF STRATUM VERT. 2	BOTTOM OF STRATUM VERT. 1	BOTTOM OF STRATUM VERT. 2	FRICTION ANGLE DEGREES
1	(WATER)	62.5	62.5	0.0	0.0	0.0	0.0	0.0
2	(RIPRAP)	132.0	132.0	0.0	0.0	0.0	0.0	40.0
3	(SI)	92.0	92.0	0.0	0.0	0.0	0.0	40.0
4	(ML)	117.0	117.0	200.0	200.0	200.0	200.0	15.0
5	(CH)	98.0	98.0	300.0	300.0	300.0	300.0	0.0
6	(SP)	122.0	122.0	0.0	0.0	0.0	0.0	33.0

ASSUMED FAILURE SURFACE NO.		ASSUMED FAILURE SURFACE ELEV.	RESISTING FORCES R_A	R_B	R_P	DRIVING FORCES D_A	$-D_P$	SUMMATION OF FORCES RESISTING	DRIVING	FACTOR OF SAFETY
A	1	-9.0	9177	10272	1529	12227	925	20978	11302	1.86
A	2	-9.0	9177	16211	14	12227	504	25402	11723	2.17
B	1	-20.0	18380	6000	8984	34853	12604	33364	22249	1.50
B	2	-20.0	18380	21381	6398	34853	10389	46159	24464	1.89
C	1	-32.0	24399	6300	15761	73673	39746	46460	33927	1.37
C	2	-32.0	24399	22500	13556	73673	35906	60455	37767	1.60

GENERAL NOTES:

CLASSIFICATION, STRATIFICATION, SHEAR STRENGTH, AND UNIT WEIGHT OF THE SOIL WERE BASED ON THE RESULTS OF UNDISTURBED BORINGS. SEE BORING DATA PLATE 40

NOTES

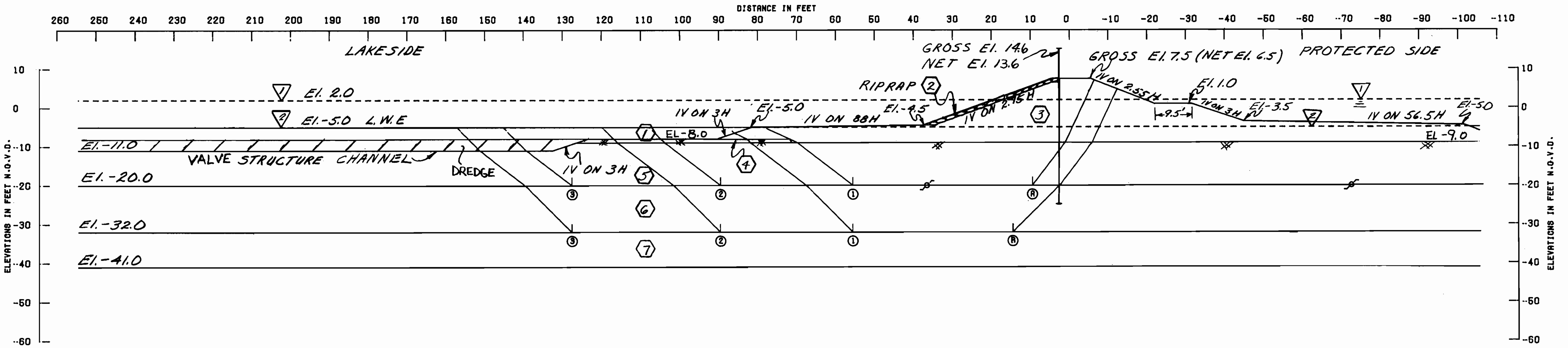
ϕ -- ANGLE OF INTERNAL FRICTION, DEGREES
C -- UNIT COHESION, P.S.F.
▽ -- STATIC WATER SURFACE
D -- HORIZONTAL DRIVING FORCE IN POUNDS
R -- HORIZONTAL RESISTING FORCE IN POUNDS
A -- AS A SUBSCRIPT, REFERS TO ACTIVE WEDGE
B -- AS A SUBSCRIPT, REFERS TO CENTRAL BLOCK
P -- AS A SUBSCRIPT, REFERS TO PASSIVE WEDGE

$$\text{FACTOR OF SAFETY} = \frac{R_A + R_B + R_P}{D_A - D_P}$$

LAKE PONTCHARTRAIN, LA. AND VICINITY
HIGH LEVEL PLAN
DESIGN MEMORANDUM NO. 19 GENERAL DESIGN
ORLEANS AVENUE OUTFALL CANAL

STABILITY ANALYSIS
SECTION K-K

U.S. ARMY ENGINEER DISTRICT, NEW ORLEANS
CORPS OF ENGINEERS
JUNE 1988 FILE NO. H-2-30290



NOTE: ▽1-▽1 PH LINE IN STRATUM 7

▽2-▽2 PH LINE IN STRATA 2, 3 AND 5

STRATUM NO.	SOIL TYPE	EFFECTIVE UNIT WT. P.C.F.		C - UNIT COHESION - P.S.F.				FRICTION ANGLE DEGREES
				CENTER OF STRATUM		BOTTOM OF STRATUM		
		VERT. 1	VERT. 2	VERT. 1	VERT. 2	VERT. 1	VERT. 2	
1	(WATER)	62.5	62.5	0.0	0.0	0.0	0.0	0.0
2	(RIPRAP)	132.0	132.0	0.0	0.0	0.0	0.C	40.0
3	(SI)	92.0	92.0	0.0	0.0	0.0	0.0	40.0
4	(CH)	100.0	10C.0	200.0	200.0	200.0	200.0	0.0
5	(ML)	117.0	117.0	200.0	200.0	200.0	200.0	15.0
6	(CH)	98.0	98.0	300.0	300.0	300.0	300.0	0.0
7	(SP)	122.0	122.0	0.0	0.0	0.0	0.0	33.0

ASSUMED FAILURE SURFACE		RESISTING FORCES			DRIVING FORCES		SUMMATION OF FORCES		FACTOR OF SAFETY
NO.	ELEV.	R_A	R_B	R_P	D_A	$-D_P$	RESISTING	DRIVING	
A 1	-20.0	18797	13519	8354	36101	12101	40670	24000	1.69
A 2	-20.0	18797	22915	7046	36101	10763	48758	25338	1.92
A 3	-20.0	18797	32520	4980	36101	9412	56297	26689	2.11
B 1	-32.0	24399	12300	15159	73673	39077	51858	34596	1.50
B 2	-32.0	24399	22500	14243	73673	36713	61142	36960	1.65
B 3	-32.0	24399	33900	12058	73673	33656	70357	40017	1.76

GENERAL NOTES:

CLASSIFICATION, STRATIFICATION, SHEAR STRENGTH, AND UNIT WEIGHT OF THE SOIL WERE BASED ON THE RESULTS OF UNDISTURBED BORINGS. SEE BORING DATA PLATE 40

NOTES

- ϕ -- ANGLE OF INTERNAL FRICTION, DEGREES
- C -- UNIT COHESION, P.S.F.
- ▽ -- STATIC WATER SURFACE
- D -- HORIZONTAL DRIVING FORCE IN POUNDS
- R -- HORIZONTAL RESISTING FORCE IN POUNDS
- A -- AS A SUBSCRIPT, REFERS TO ACTIVE WEDGE
- B -- AS A SUBSCRIPT, REFERS TO CENTRAL BLOCK
- P -- AS A SUBSCRIPT, REFERS TO PASSIVE WEDGE

$$\text{FACTOR OF SAFETY} = \frac{R_A + R_B + R_P}{D_A - D_P}$$

LAKE PONTCHARTRAIN, LA. AND VICINITY
HIGH LEVEL PLAN

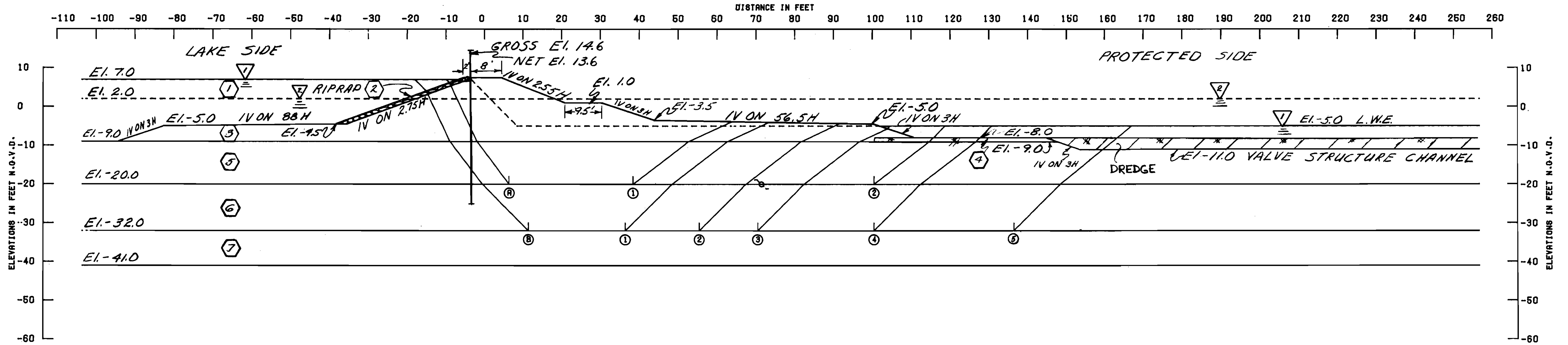
DESIGN MEMORANDUM NO. 19 GENERAL DESIGN

ORLEANS AVENUE OUTFALL CANAL

STABILITY ANALYSIS
SECTION L-L

U.S. ARMY ENGINEER DISTRICT, NEW ORLEANS
CORPS OF ENGINEERS

JUNE 1988 FILE NO. H-2-30290



NOTE: ▽—▽ PH LINE IN STRATA ⟨2⟩, ⟨3⟩, AND ⟨5⟩

▽—▽ PH LINE IN STRATUM ⟨7⟩

STRATUM NO.	SOIL TYPE	EFFECTIVE UNIT WT. P.C.F.		C - UNIT COHESION - P.S.F.				FRICTION ANGLE DEGREES
				CENTER OF STRATUM		BOTTOM OF STRATUM		
		VERT. 1	VERT. 2	VERT. 1	VERT. 2	VERT. 1	VERT. 2	
⟨1⟩	(WATER)	62.5	62.5	0.0	0.0	0.0	0.0	0.0
⟨2⟩	(RIPRAP)	132.0	132.0	0.C	0.0	0.0	0.0	40.0
⟨3⟩	(SI)	92.0	92.0	0.0	0.0	0.0	0.0	40.0
⟨4⟩	(CH)	100.0	100.0	200.0	200.0	200.0	200.0	0.0
⟨5⟩	(ML)	117.0	117.0	200.0	200.0	200.0	200.0	15.0
⟨6⟩	(CH)	98.0	98.0	300.0	300.0	300.0	300.0	0.0
⟨7⟩	(CH)	122.0	122.0	0.0	0.0	0.0	0.0	33.0

ASSUMED FAILURE SURFACE		RESISTING FORCES			DRIVING FORCES		SUMMATION OF FORCES		FACTOR OF SAFETY
NO.	ELEV.	R_A	R_B	R_P	D_A	$-D_P$	RESISTING	DRIVING	
(A) (1)	-20.0	13316	9600	11287	36290	14216	34203	22074	1.55
(A) (2)	-20.0	13316	28017	7347	36290	11192	48680	25098	1.94
(B) (1)	-32.0	18175	7500	17827	75185	43034	43502	32151	1.35
(B) (2)	-32.0	18175	13200	17050	75185	41358	48425	33827	1.43
(B) (3)	-32.0	18175	17700	16099	75185	40585	51974	3460C	1.50
(B) (4)	-32.0	18175	26700	14244	75185	37273	59119	37912	1.56
(B) (5)	-32.0	18175	37500	12180	75185	35257	67855	39928	1.70

GENERAL NOTES:

CLASSIFICATION, STRATIFICATION, SHEAR STRENGTH, AND UNIT WEIGHT OF THE SOIL WERE BASED ON THE RESULTS OF UNDISTURBED BORINGS. SEE BORING DATA PLATE 40

NOTES

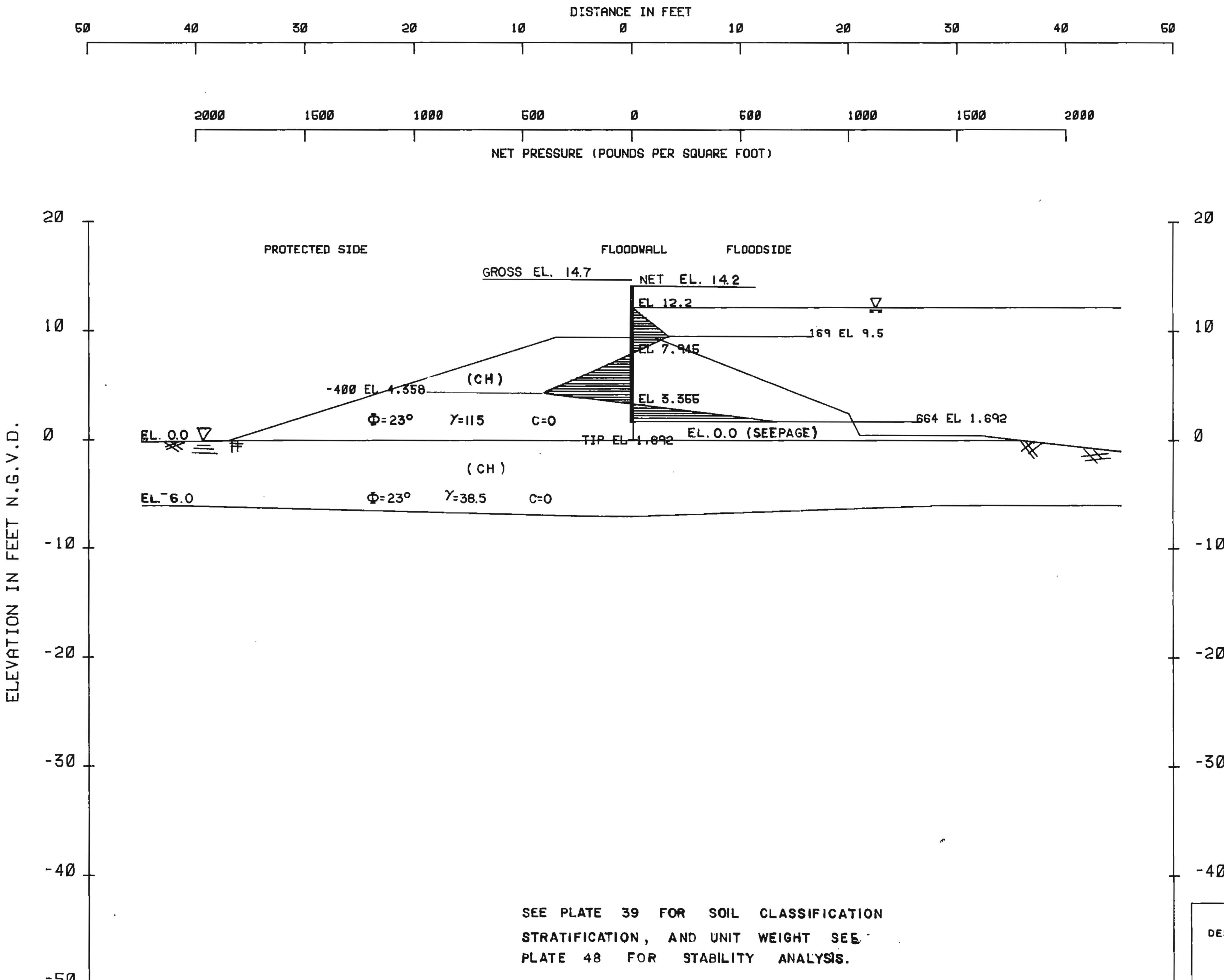
ϕ -- ANGLE OF INTERNAL FRICTION, DEGREES
C -- UNIT COHESION, P.S.F.
▽ -- STATIC WATER SURFACE
D -- HORIZONTAL DRIVING FORCE IN POUNDS
R -- HORIZONTAL RESISTING FORCE IN POUNDS
A -- AS A SUBSCRIPT, REFERS TO ACTIVE WEDGE
B -- AS A SUBSCRIPT, REFERS TO CENTRAL BLOCK
P -- AS A SUBSCRIPT, REFERS TO PASSIVE WEDGE

$$\text{FACTOR OF SAFETY} = \frac{R_A + R_B + R_P}{D_A - D_P}$$

LAKE PONTCHARTRAIN, LA. AND VICINITY
HIGH LEVEL PLAN
DESIGN MEMORANDUM NO.19 GENERAL DESIGN
ORLEANS AVENUF OUTFALL CANAL

STABILITY ANALYSIS
SECTION M-M

U.S. ARMY ENGINEER DISTRICT, NEW ORLEANS
CORPS OF ENGINEERS
JUNE 1988 FILE NO. H-2-30290



ELEVATION	PRESSURE
12.20	0.0
9.50	168.9
7.95	0.0
6.50	-159.3
4.50	-390.0
4.36	-400.4
3.35	0.0
1.69	663.6
1.69	0.0

SEE PLATE 39 FOR SOIL CLASSIFICATION STRATIFICATION, AND UNIT WEIGHT SEE PLATE 48 FOR STABILITY ANALYSIS.

NET DIAGRAM

(S) CASE F.S.=1.5

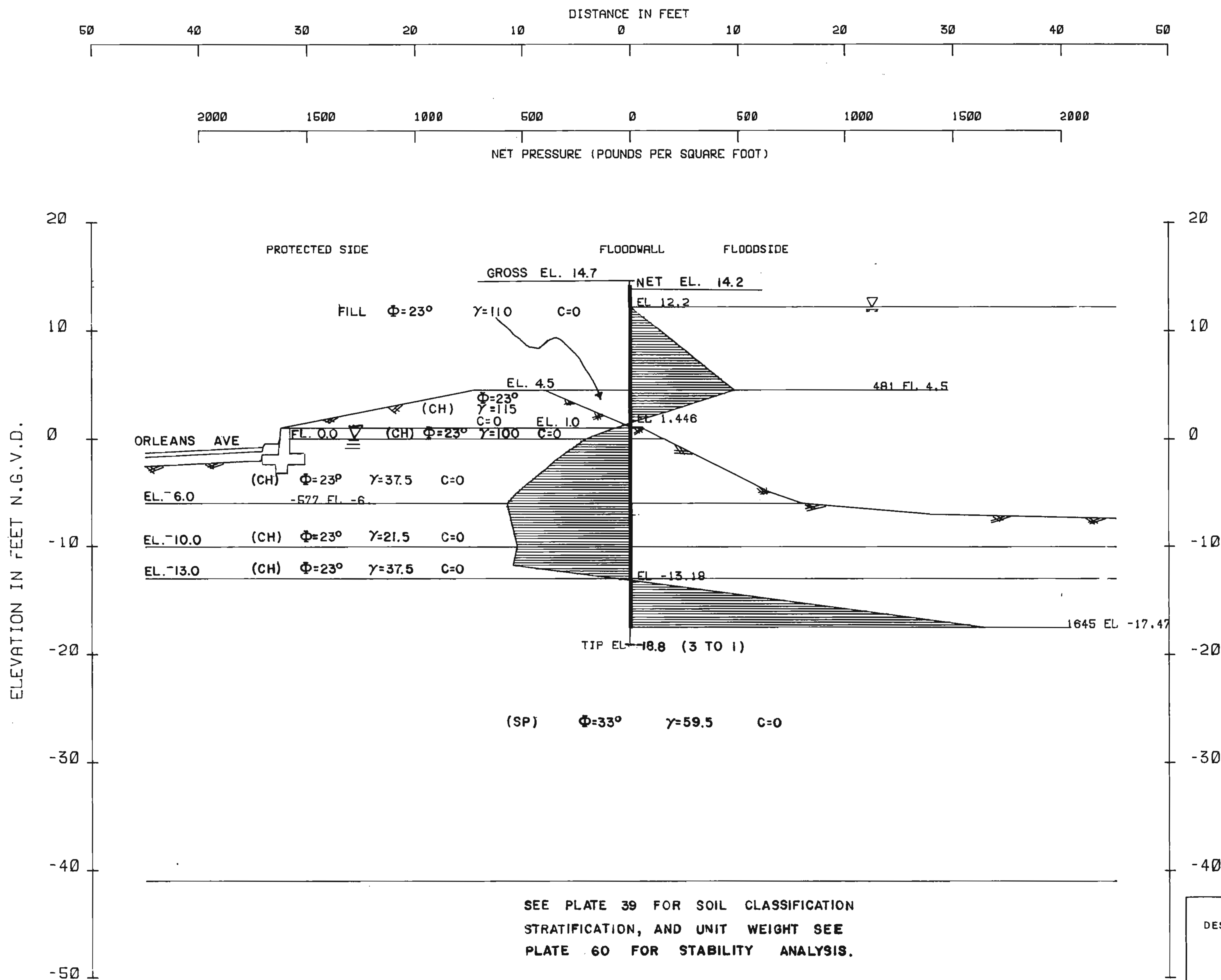
LAKE PONTCHARTRAIN, LA. AND VICINITY
HIGH LEVEL PLAN
DESIGN MEMORANDUM NO. 19 – GENERAL DESIGN
ORLEANS AVENUE OUTFALL CANAL

I-WALL ANALYSIS

STA. 0+00 TO 36+50 EAST SIDE

U.S. ARMY ENGINEER DISTRICT, NEW ORLEANS
CORPS OF ENGINEERS

JUNE 1988 FILE NO. H-2-30290



ELEVATION	PRESSURE
12.20	0.0
4.50	481.3
1.45	0.0
1.10	-54.5
1.00	-72.8
0.00	-206.7
-1.00	-280.9
-5.00	-527.9
-6.00	-576.8
-10.00	-526.9
-11.76	-547.2
-13.18	0.0
-17.47	1645.1
-17.47	0.0

SEE PLATE 39 FOR SOIL CLASSIFICATION STRATIFICATION, AND UNIT WEIGHT SEE PLATE 60 FOR STABILITY ANALYSIS.

NET DIAGRAM

(S) CASE F.S.=1.2

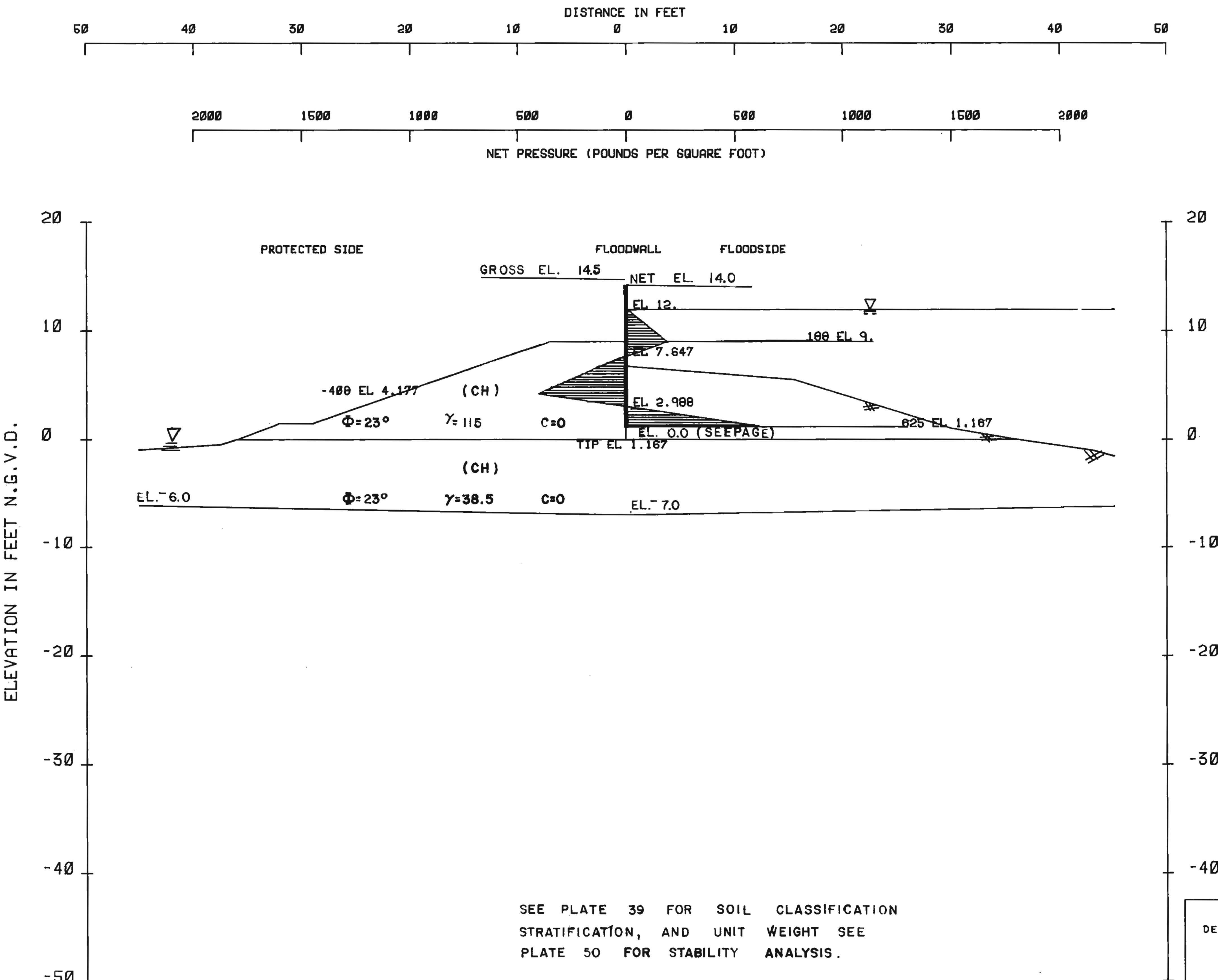
LAKE PONTCHARTRAIN, LA. AND VICINITY
HIGH LEVEL PLAN
DESIGN MEMORANDUM NO.19 – GENERAL DESIGN
ORLEANS AVENUE OUTFALL CANAL

I-WALL ANALYSIS

STA. 2+44 TO 29+40 WEST SIDE

U.S. ARMY ENGINEER DISTRICT, NEW ORLEANS
CORPS OF ENGINEERS

JUNE 1988 FILE NO. H-2-30290



ELEVATION	PRESSURE
12.00	0.0
9.00	187.5
7.65	0.0
6.75	-124.3
4.18	-400.0
2.99	0.0
1.17	624.9
1.17	0.0

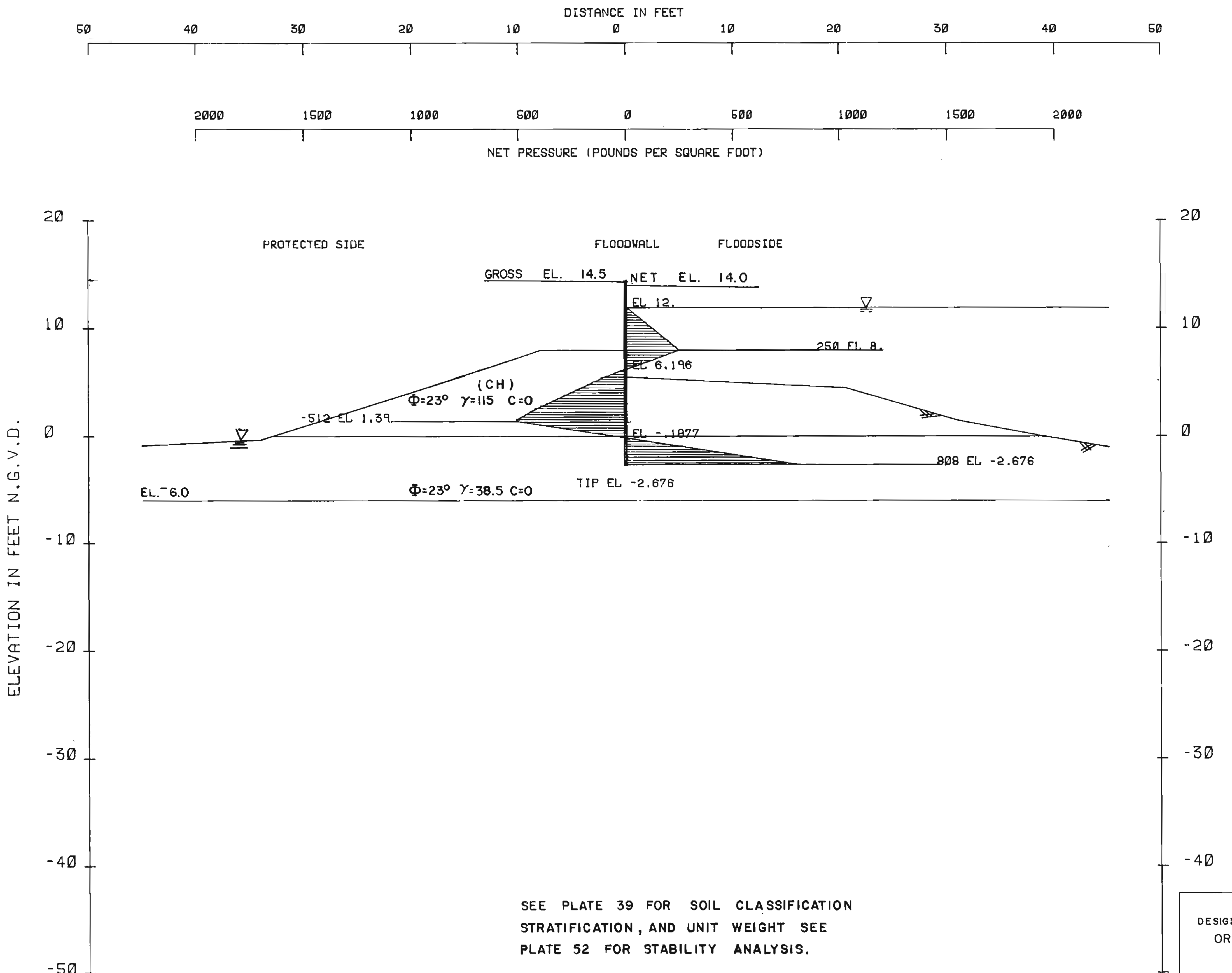
SEE PLATE 39 FOR SOIL CLASSIFICATION STRATIFICATION, AND UNIT WEIGHT SEE PLATE 50 FOR STABILITY ANALYSIS.

NET DIAGRAM

(S) CASE F.S.=1.5

LAKE PONTCHARTRAIN, LA. AND VICINITY
HIGH LEVEL PLAN
DESIGN MEMORANDUM NO.19 - GENERAL DESIGN
ORLEANS AVENUE OUTFALL CANAL
I-WALL ANALYSIS
STA. 36+50 TO 50+00 EAST SIDE
U.S. ARMY ENGINEER DISTRICT, NEW ORLEANS
CORPS OF ENGINEERS

JUNE 1988 FILE NO. H-2-30290



ELEVATION	PRESSURE
12.00	0.0
8.00	250.0
6.20	0.0
5.50	-96.4
2.50	-425.2
1.50	-507.1
1.39	-512.4
-0.19	0.0
-2.68	808.1
-2.68	0.0

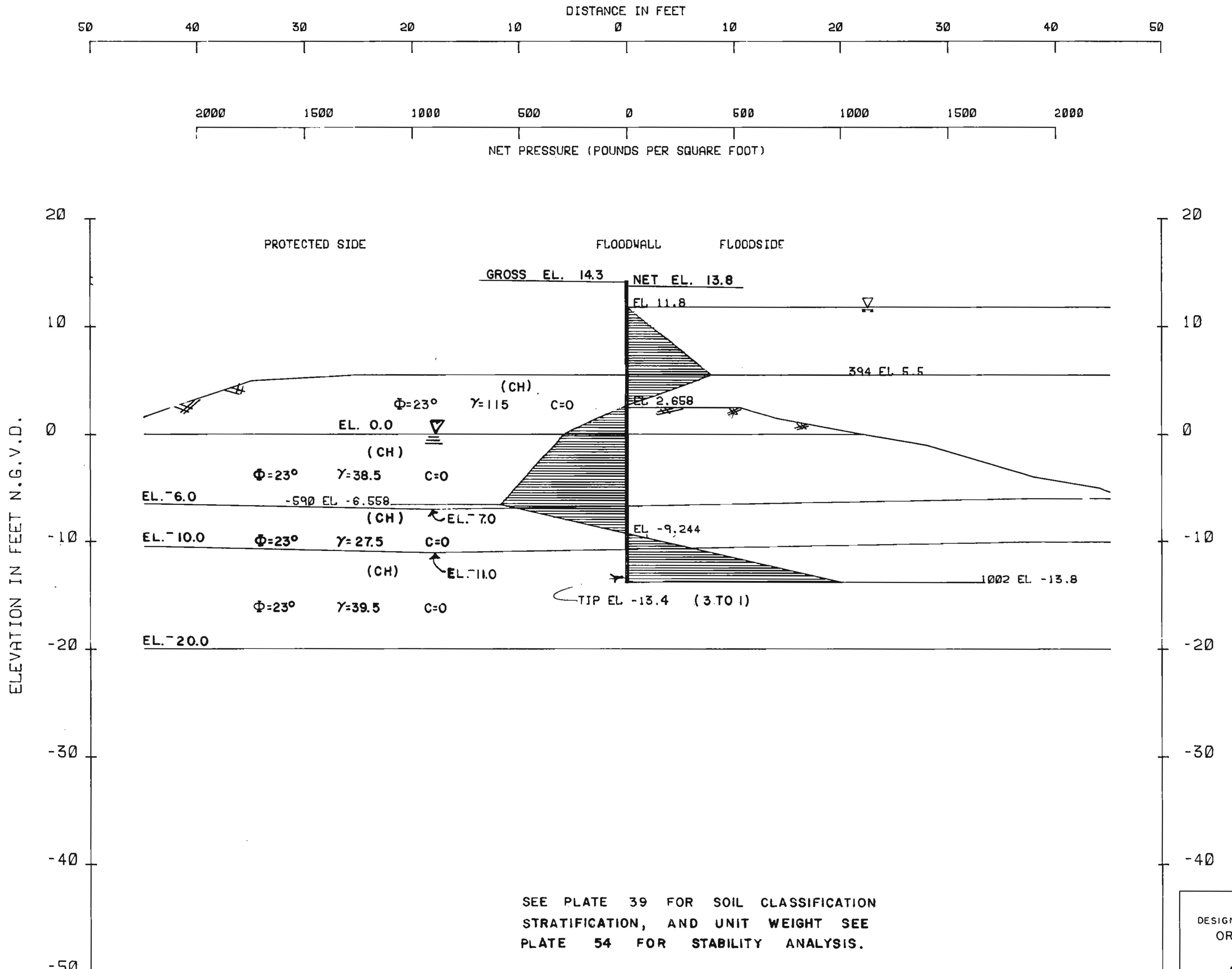
SEE PLATE 39 FOR SOIL CLASSIFICATION STRATIFICATION, AND UNIT WEIGHT SEE PLATE 52 FOR STABILITY ANALYSIS.

NET DIAGRAM

(S) CASE F.S.=1.5

LAKE PONTCHARTRAIN, LA. AND VICINITY
HIGH LEVEL PLAN
DESIGN MEMORANDUM NO.19 – GENERAL DESIGN
ORLEANS AVENUE OUTFALL CANAL
I-WALL ANALYSIS
STA. 50+00 TO 64+00 EAST SIDE
U.S. ARMY ENGINEER DISTRICT, NEW ORLEANS
CORPS OF ENGINEERS

JUNE 1988 FILE NO. H-2-30290



ELEVATION	PRESSURE
11.80	0.0
5.50	393.8
2.66	0.0
2.50	-21.9
0.00	-293.3
-6.56	-590.3
-9.24	0.0
-13.80	1002.4
-13.80	0.0

SEE PLATE 39 FOR SOIL CLASSIFICATION STRATIFICATION, AND UNIT WEIGHT SEE PLATE 54 FOR STABILITY ANALYSIS.

NET DIAGRAM

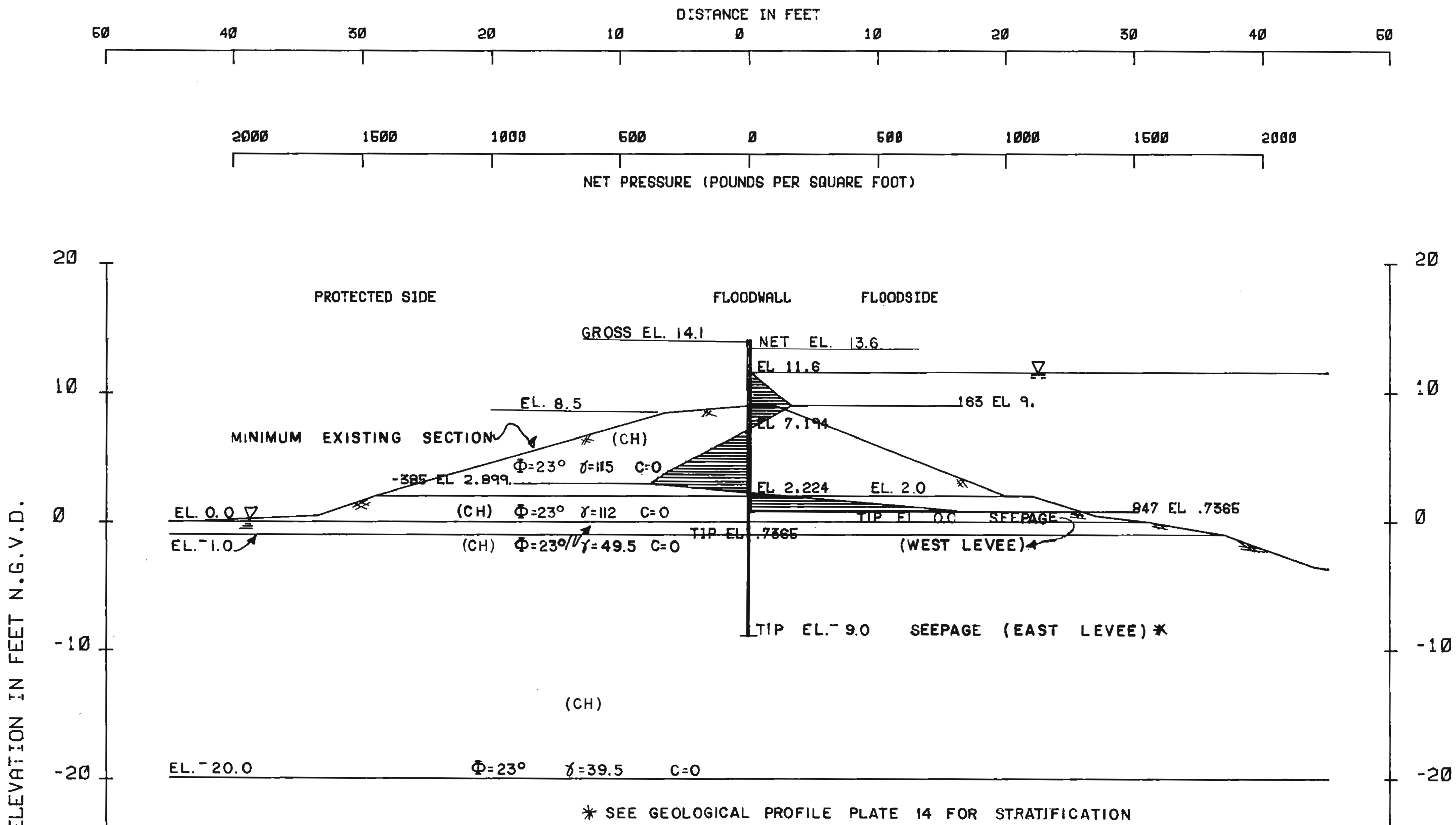
(S) CASE F.S.=1.5

LAKE PONTCHARTRAIN, LA. AND VICINITY
HIGH LEVEE PLAN
DESIGN MEMORANDUM NO. 19 – GENERAL DESIGN
ORLEANS AVENUE OUTFALL CANAL

I- WALL ANALYSIS
STA. 64+00 TO 90+50
EAST SIDE

U.S. ARMY ENGINEER DISTRICT, NEW ORLEANS
CORPS OF ENGINEERS

JUNE 1988 FILE NO. H-2- 30290



ELEVATION	PRESSURE
11.60	0.0
9.00	162.5
7.19	0.0
6.00	-109.8
4.00	-303.4
3.00	-378.6
2.90	-384.6
2.22	0.0
0.74	847.0
0.74	0.0

SEE PLATE 40 FOR SOIL CLASSIFICATION STRATIFICATION, AND UNIT WEIGHT SEE PLATE 57 FOR STABILITY ANALYSIS.

NET DIAGRAM

(S) CASE F.S.=1.5

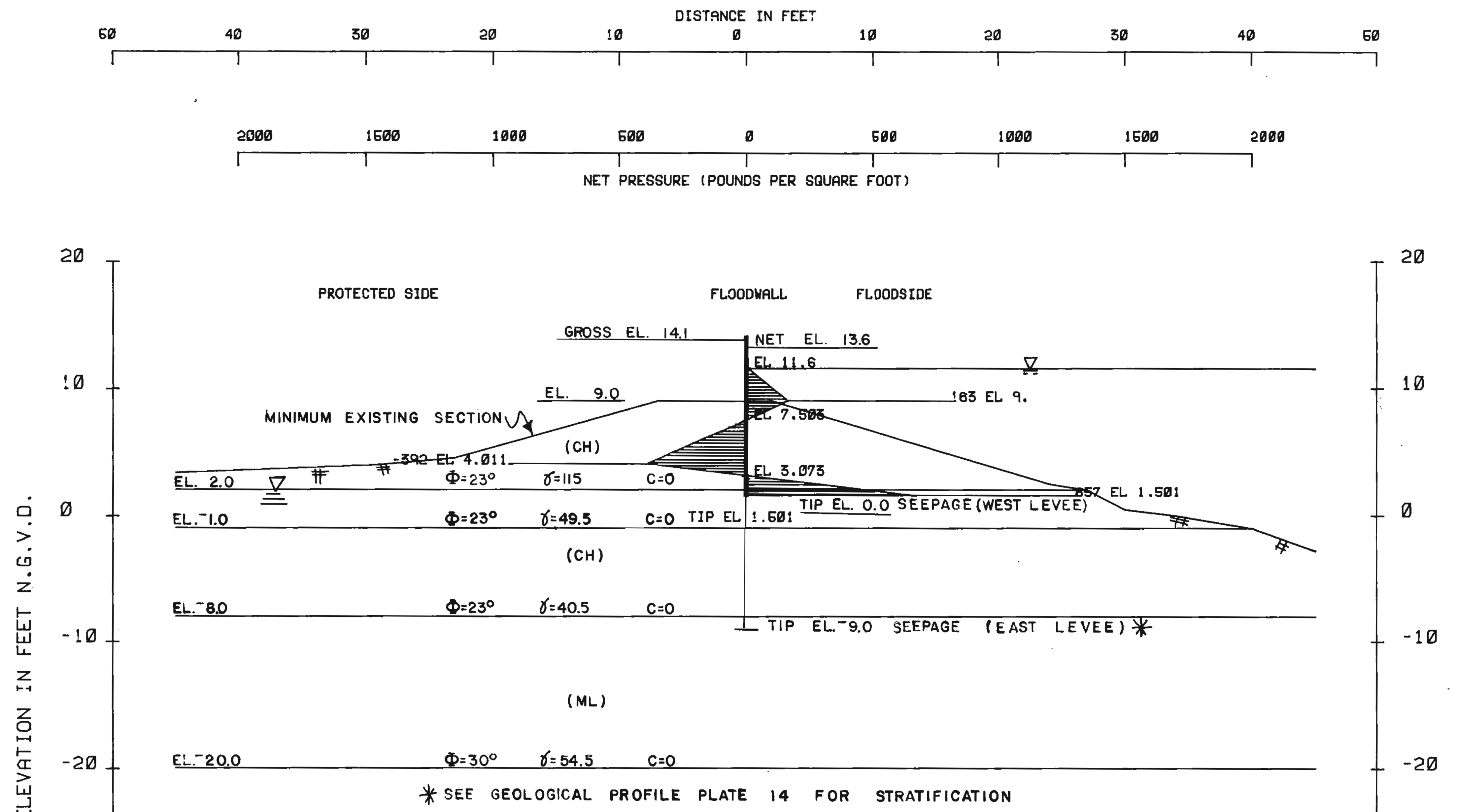
LAKE PONTCHARTRAIN, LA. AND VICINITY
HIGH LEVEE PLAN
DESIGN MEMORANDUM NO.19 — GENERAL DESIGN
ORLEANS AVENUE OUTFALL CANAL

I-WALL ANALYSIS

STA. 90+50 TO 104+00

U.S. ARMY ENGINEER DISTRICT, NEW ORLEANS
CORPS OF ENGINEERS

JUNE 1988 FILE NO. H-2-30290



ELEVATION	PRESSURE
11.60	0.0
9.00	162.5
7.50	0.0
6.00	-165.0
4.01	-391.8
3.07	0.0
1.50	656.8
1.50	0.0

SEE PLATE 40 FOR SOIL CLASSIFICATION STRATIFICATION, AND UNIT WEIGHT SEE PLATE 59 FOR STABILITY ANALYSIS.

NET DIAGRAM

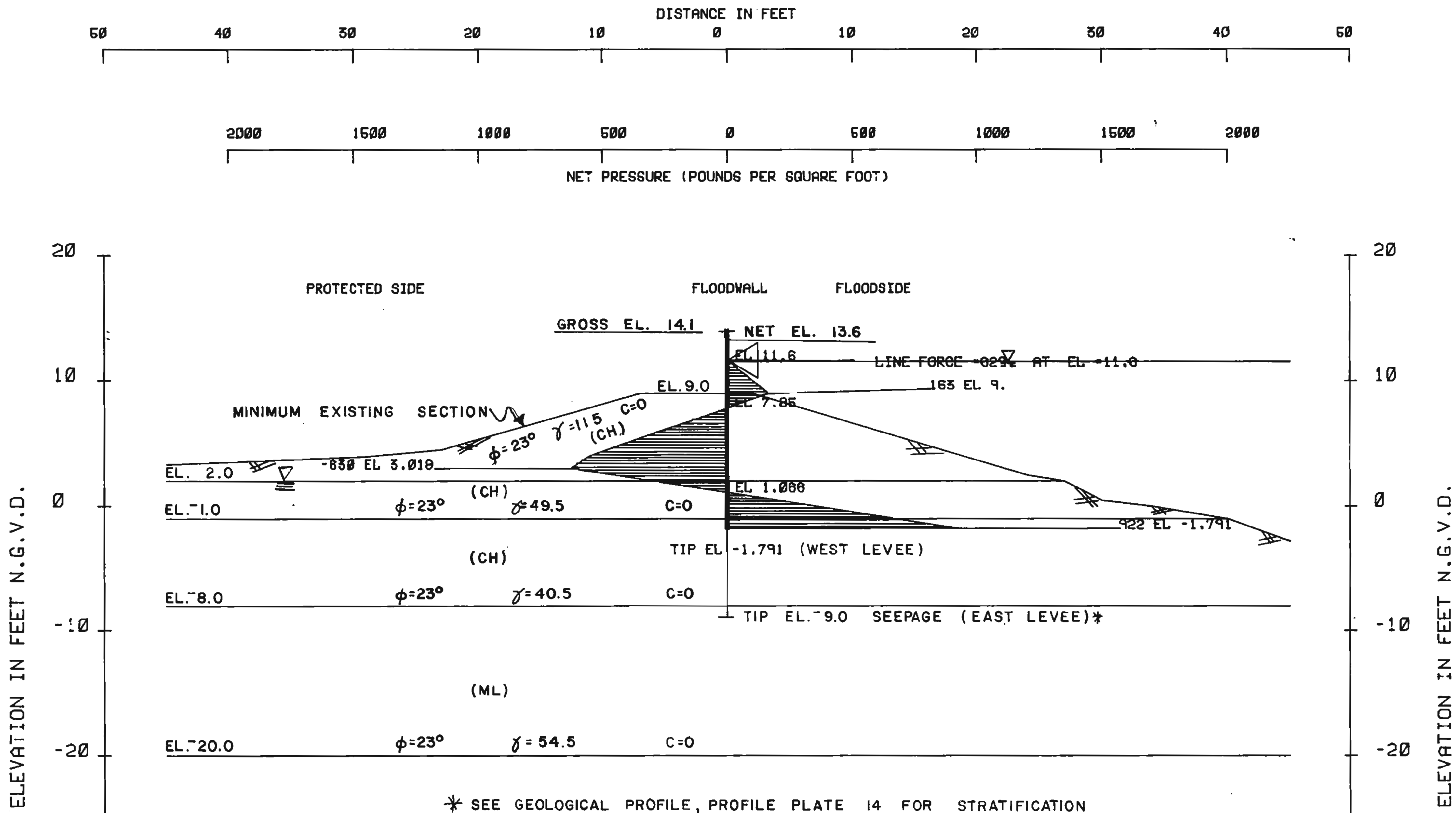
(S) CASE F.S.=1.5

LAKE PONTCHARTRAIN, LA. AND VICINITY
HIGH LEVEL PLAN
DESIGN MEMORANDUM NO. 19 – GENERAL DESIGN
ORLEANS AVENUE OUTFALL CANAL

I-WALL ANALYSIS

STA. 104+00 TO 118+67 EAST AND STA. 118+87 WEST

U.S. ARMY ENGINEER DISTRICT, NEW ORLEANS
CORPS OF ENGINEERS
JUNE 1988 FILE NO. H-2-30290



ELEVATION	PRESSURE
11.60	0.0
9.00	162.5
7.85	0.0
6.00	-262.3
5.00	-409.1
4.00	-550.7
3.02	-629.6
1.07	0.0
-1.79	922.0
-1.79	0.0

SEE PLATE 40 FOR SOIL CLASSIFICATION STRATIFICATION, AND UNIT WEIGHT SEE PLATE 59 FOR STABILITY ANALYSIS.

NET DIAGRAM

(S) CASE F.S.=1.2

LAKE PONTCHARTRAIN, LA. AND VICINITY
HIGH LEVEL PLAN
DESIGN MEMORANDUM NO.19 – GENERAL DESIGN
ORLEANS AVENUE OUTFALL CANAL

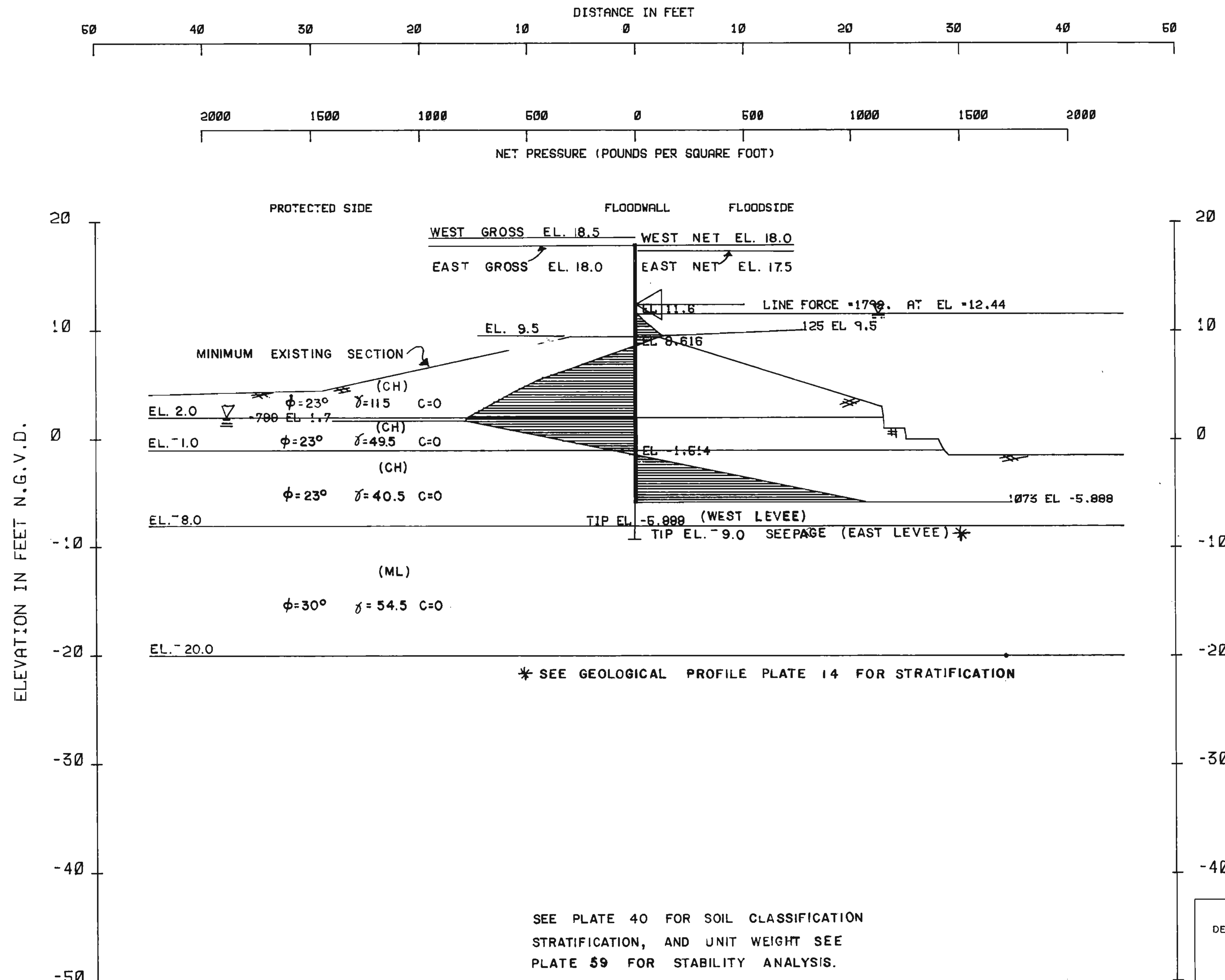
I-WALL ANALYSIS

STA. 118+67 EAST & 118+87 WEST

START OF TRANSITION

U.S. ARMY ENGINEER DISTRICT, NEW ORLEANS
CORPS OF ENGINEERS

JUNE 1988 FILE NO. H-2-30290



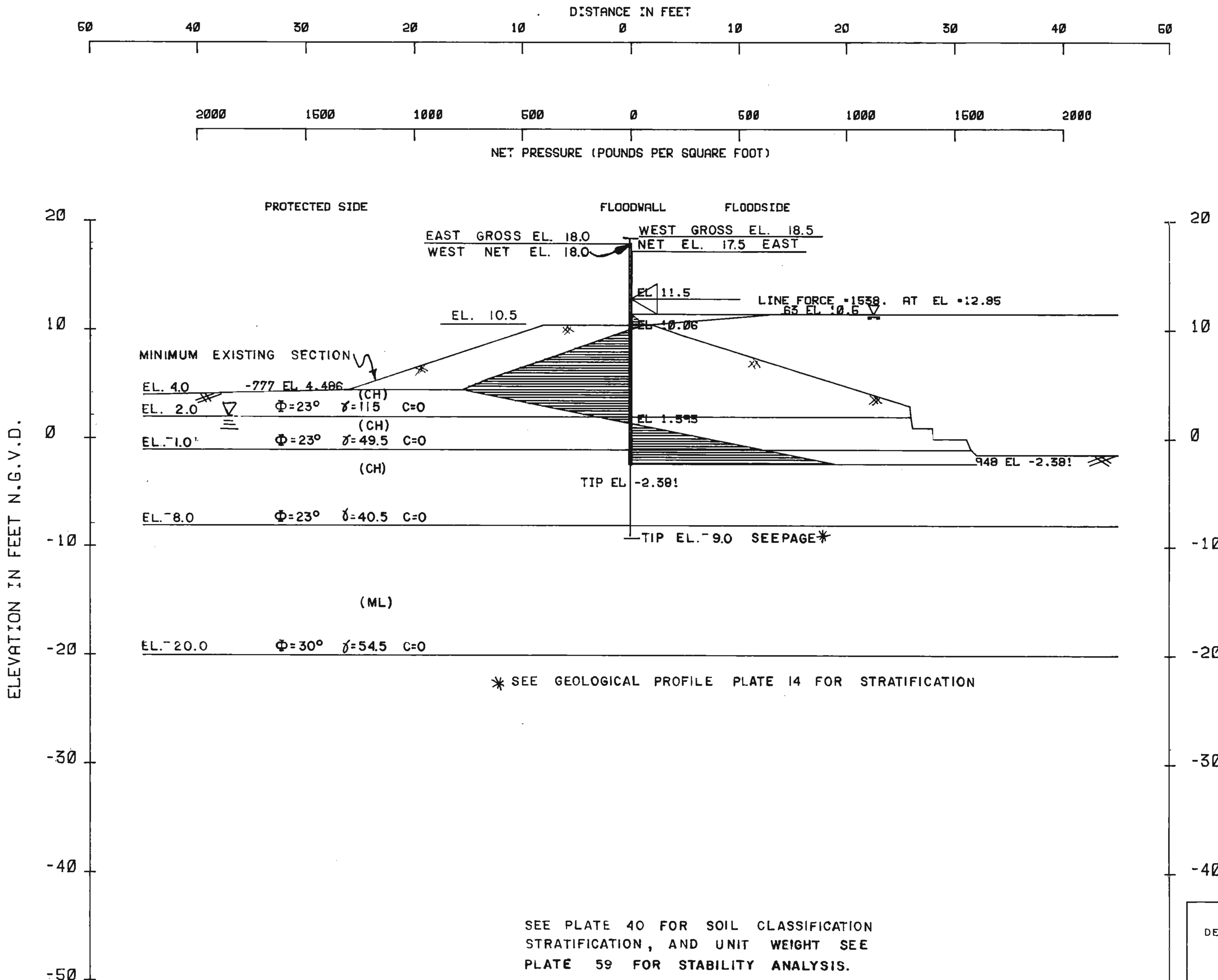
ELEVATION	PRESSURE
11.60	0.0
10.60	56.3
9.50	125.0
8.82	0.0
6.50	-299.8
5.50	-445.9
4.50	-551.0
2.00	-790.9
1.70	-788.4
-1.51	0.0
-5.89	1073.3
-5.89	0.0

SEE PLATE 40 FOR SOIL CLASSIFICATION STRATIFICATION, AND UNIT WEIGHT SEE PLATE 59 FOR STABILITY ANALYSIS.

NET DIAGRAM

(S) CASE F.S.=1.2

LAKE PONTCHARTRAIN, LA. AND VICINITY
HIGH LEVEL PLAN
DESIGN MEMORANDUM NO.19 – GENERAL DESIGN
ORLEANS AVENUE OUTFALL CANAL
I-WALL ANALYSIS
STA. 124+67 EAST & 124+87 WEST
END OF TRANSITION
U.S. ARMY ENGINEER DISTRICT, NEW ORLEANS
CORPS OF ENGINEERS
JUNE 1988 FILE NO. H-2-30290



SEE PLATE 40 FOR SOIL CLASSIFICATION STRATIFICATION, AND UNIT WEIGHT SEE PLATE 59 FOR STABILITY ANALYSIS.

NET DIAGRAM

(S) CASE F.S.=1.2

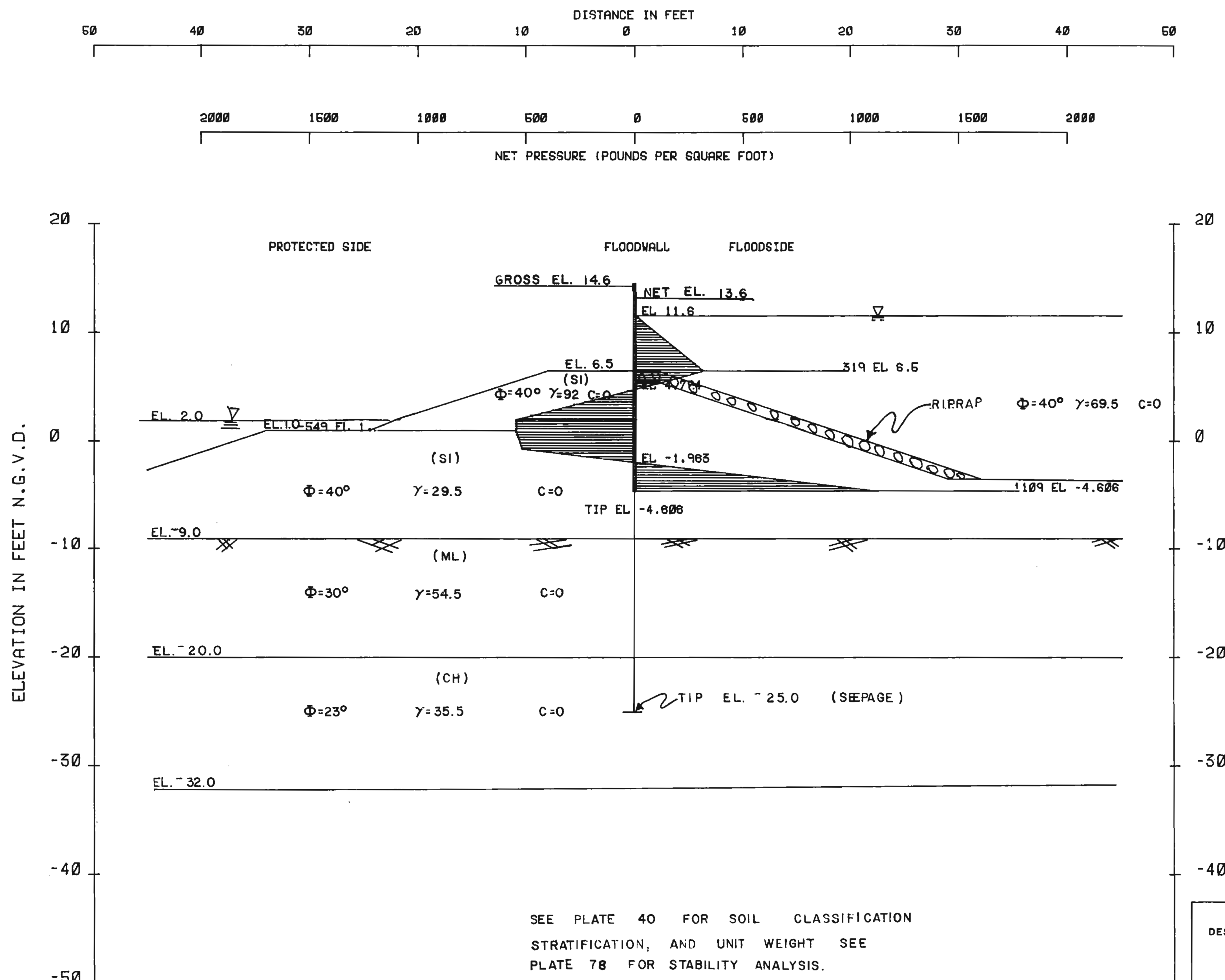
ELEVATION	PRESSURE
11.50	0.0
10.50	62.5
10.06	0.0
7.50	-362.4
5.50	-655.0
4.50	-776.0
4.49	-777.1
1.39	0.0
-2.38	948.2
-2.38	0.0

LAKE PONTCHARTRAIN, LA. AND VICINITY
HIGH LEVEL PLAN
DESIGN MEMORANDUM NO. 19 – GENERAL DESIGN

I-WALL ANALYSIS
STA. 124+67 TO 128+67 EAST
AND STA. 124+87 WEST

U.S. ARMY ENGINEER DISTRICT, NEW ORLEANS
CORPS OF ENGINEERS

JUNE 1988 FILE NO. H-2-30290



ELEVATION	PRESSURE
11.60	0.0
6.50	319.9
5.50	137.6
4.79	0.0
2.00	-548.5
1.00	-549.2
-0.72	-519.1
-1.96	0.0
-4.61	1108.6
-4.61	0.0

SEE PLATE 40 FOR SOIL CLASSIFICATION STRATIFICATION, AND UNIT WEIGHT SEE PLATE 78 FOR STABILITY ANALYSIS.

NET DIAGRAM

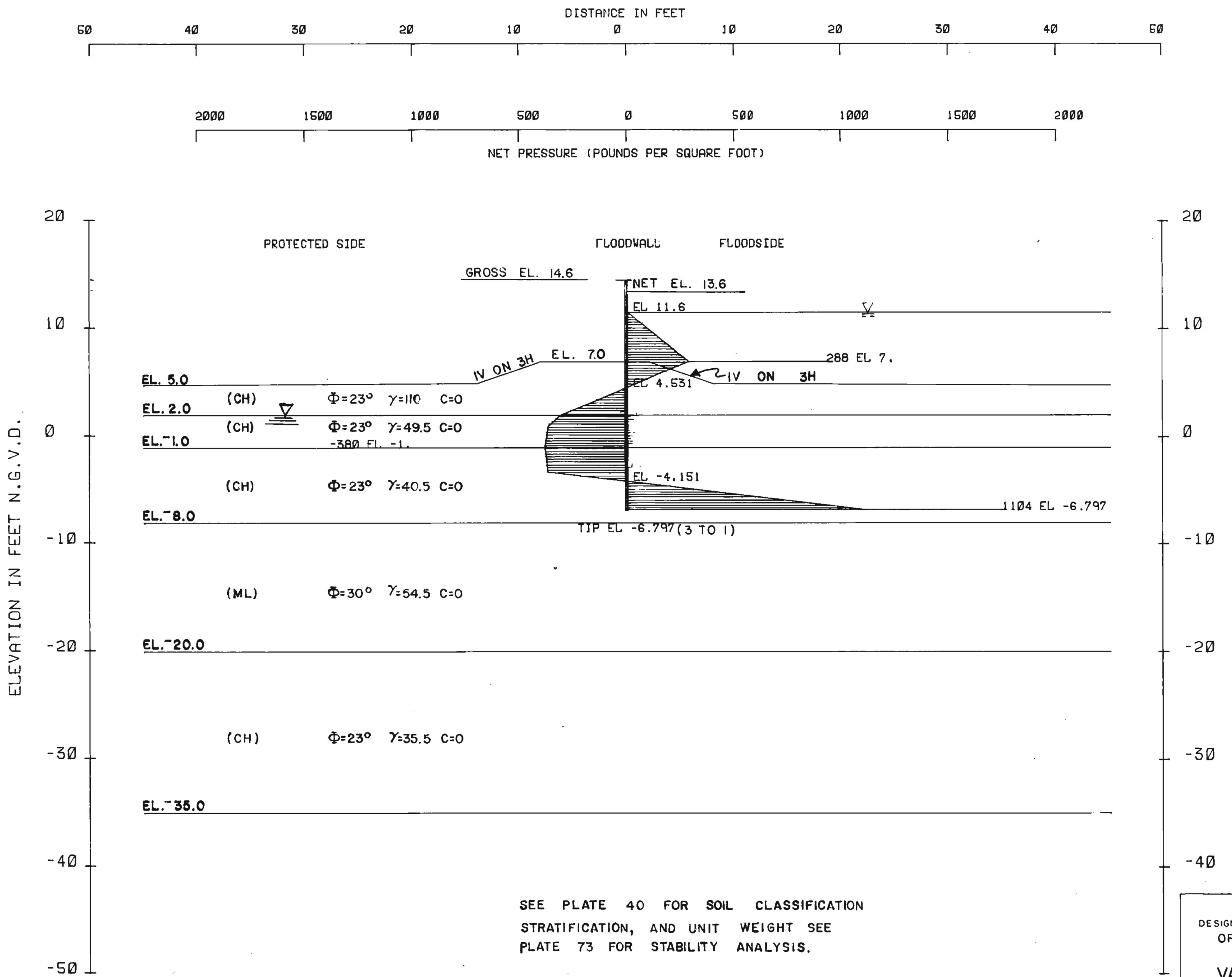
(Q) CASE F.S.=1.5

LAKE PONTCHARTRAIN, LA. AND VICINITY
HIGH LEVEL PLAN
DESIGN MEMORANDUM NO.19 - GENERAL DESIGN
ORLEANS AVENUE OUTFALL CANAL

I-WALL ANALYSIS VALVE STRUCTURE - EAST CLOSURE LEVEE

U.S. ARMY ENGINEER DISTRICT, NEW ORLEANS
CORPS OF ENGINEERS

JUNE 1988 FILE NO. H-2-30290



ELEVATION	PRESSURE
11.60	0.0
7.00	287.5
4.53	0.0
4.00	-62.4
2.00	-304.8
1.00	-366.9
-1.00	-379.9
-3.27	-367.7
-4.15	0.0
-6.80	1103.6
-6.80	0.0

SEE PLATE 40 FOR SOIL CLASSIFICATION STRATIFICATION, AND UNIT WEIGHT SEE PLATE 73 FOR STABILITY ANALYSIS.

NET DIAGRAM

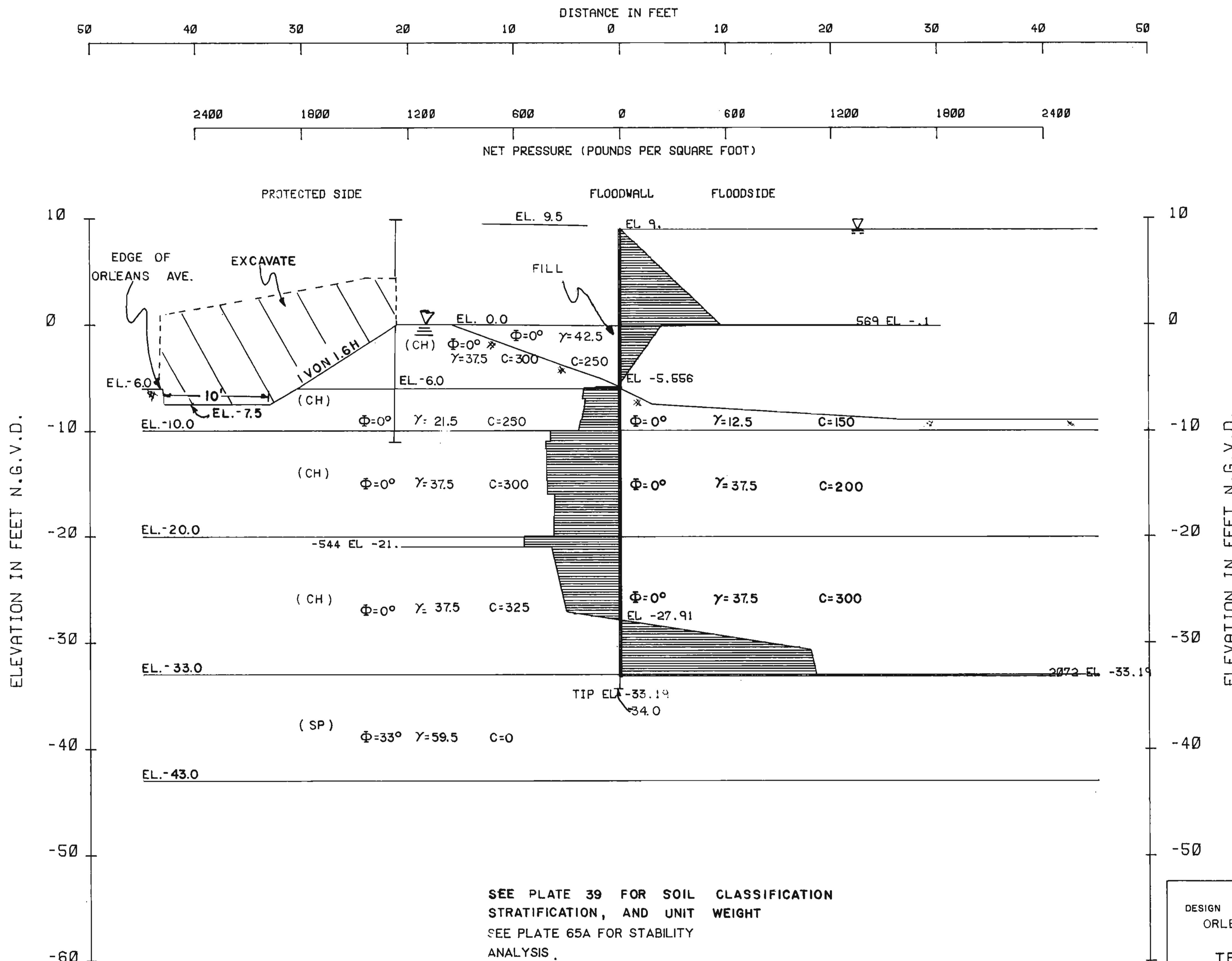
(S) CASE F.S.=1.35

LAKE PONTCHARTRAIN, LA. AND VICINITY
HIGH LEVEE PLAN
DESIGN MEMORANDUM NO. 19 — GENERAL DESIGN
ORLEANS AVENUE OUTFALL CANAL

I-WALL ANALYSIS
VALVE STRUCTURE - WEST
CLOSURE LEVEE

U.S. ARMY ENGINEER DISTRICT, NEW ORLEANS
CORPS OF ENGINEERS

JUNE 1988 FILE NO. H-2-30290



ELEVATION	PRESSURE
9.00	0.0
-0.10	568.7
-0.10	233.3
-5.56	0.0
-5.90	-14.7
-5.90	-135.9
-6.00	-139.3
-6.00	-206.0
-7.00	-216.3
-7.00	-195.1
-9.00	-219.0
-9.00	-223.7
-10.00	-235.3
-10.00	-368.6
-10.00	-396.1
-11.00	-396.0
-11.00	-423.4
-16.00	-414.1
-16.00	-373.9
-20.00	-376.9
-20.00	-543.6
-21.00	-544.3
-21.00	-389.5
-27.14	-304.9
-27.91	0.0
-30.66	1077.1
-33.00	1109.4
-33.00	1996.4
-33.19	2072.0
-33.19	0.0

SEE PLATE 39 FOR SOIL CLASSIFICATION STRATIFICATION, AND UNIT WEIGHT

SEE PLATE 65A FOR STABILITY ANALYSIS.

NET DIAGRAM

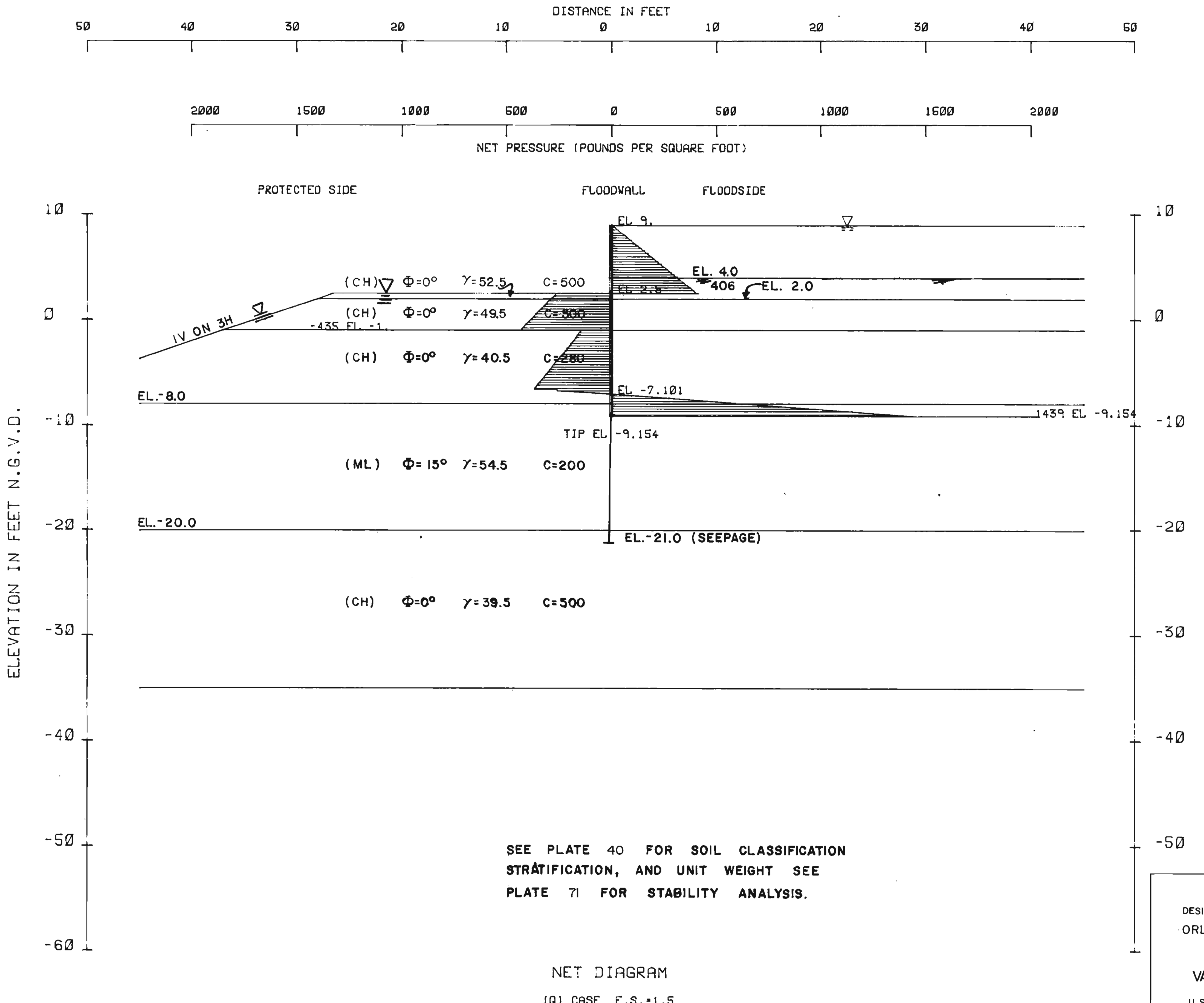
(Q) CASE F.S.=1.5

LAKE PONTCHARTRAIN, LA, AND VICINITY
HIGH LEVEE PLAN
DESIGN MEMORANDUM NO. 19 - GENERAL DESIGN
ORLEANS AVENUE OUTFALL CANAL

I- WALL ANALYSIS
TEMPORARY COFFERDAM
STA. 64+00 TO 90+50
WEST SIDE

U.S. ARMY ENGINEER DISTRICT, NEW ORLEANS
CORPS OF ENGINEERS

JUNE 1988 FILE NO. H-2- 30290



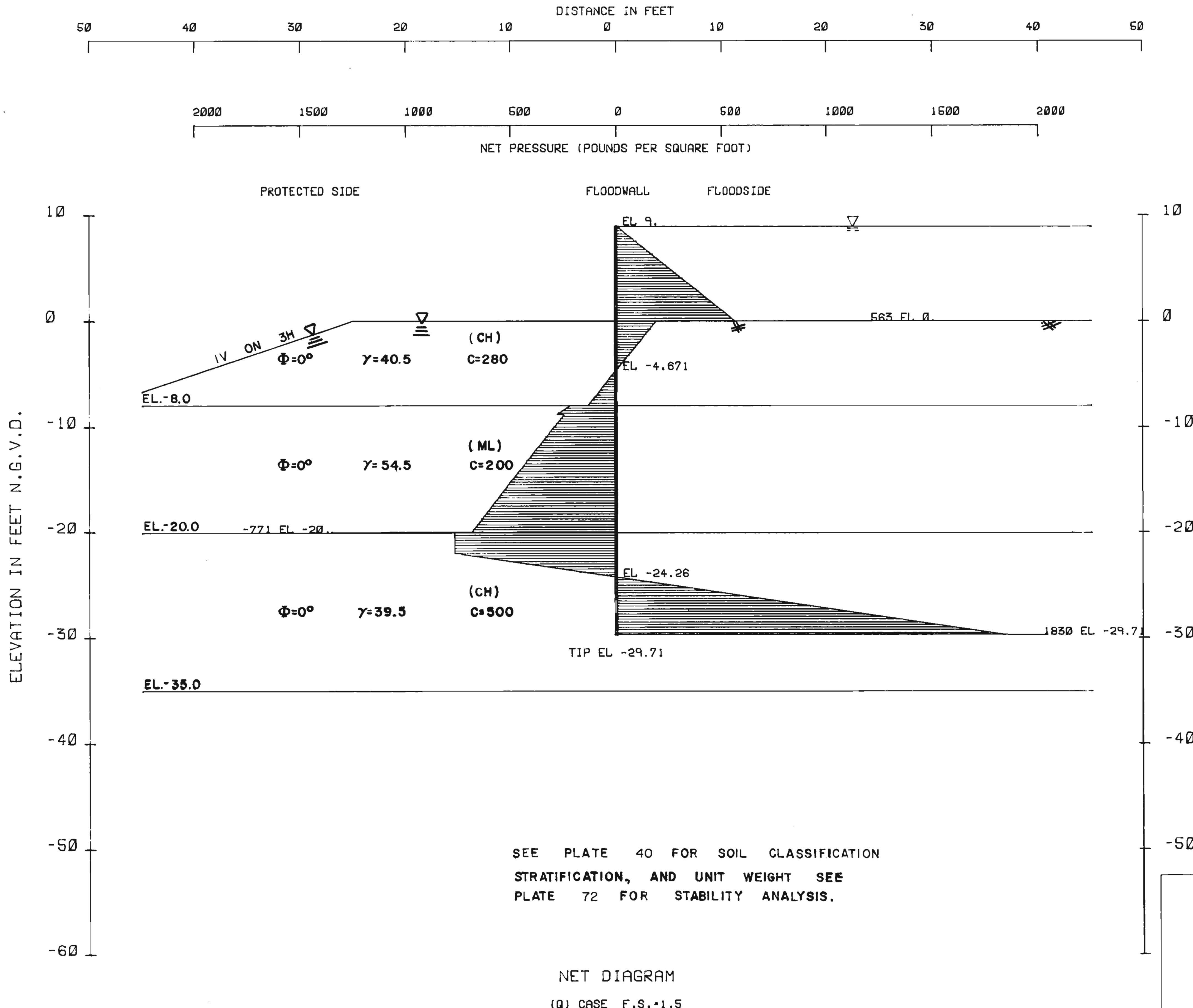
ELEVATION	PRESSURE
9.00	0.0
2.50	406.3
2.50	0.0
2.50	-260.4
2.00	-286.7
-1.00	-435.2
-1.00	-141.8
-6.58	-367.7
-6.63	-327.4
-6.63	-261.7
-7.10	0.0
-9.15	1438.6
-9.15	0.0

SEE PLATE 40 FOR SOIL CLASSIFICATION STRATIFICATION, AND UNIT WEIGHT SEE PLATE 71 FOR STABILITY ANALYSIS.

NET DIAGRAM

(Q) CASE F.S.=1.5

LAKE PONTCHARTRAIN, LA. AND VICINITY
HIGH LEVEL PLAN
DESIGN MEMORANDUM NO. 19 GENERAL DESIGN
ORLEANS AVENUE OUTFALL CANAL
I-WALL ANALYSIS
VALVE STRUCTURE EXCAVATION
U.S. ARMY ENGINEER DISTRICT, NEW ORLEANS
CORPS OF ENGINEERS
JUNE 1988 FILE NO. H-2-30290



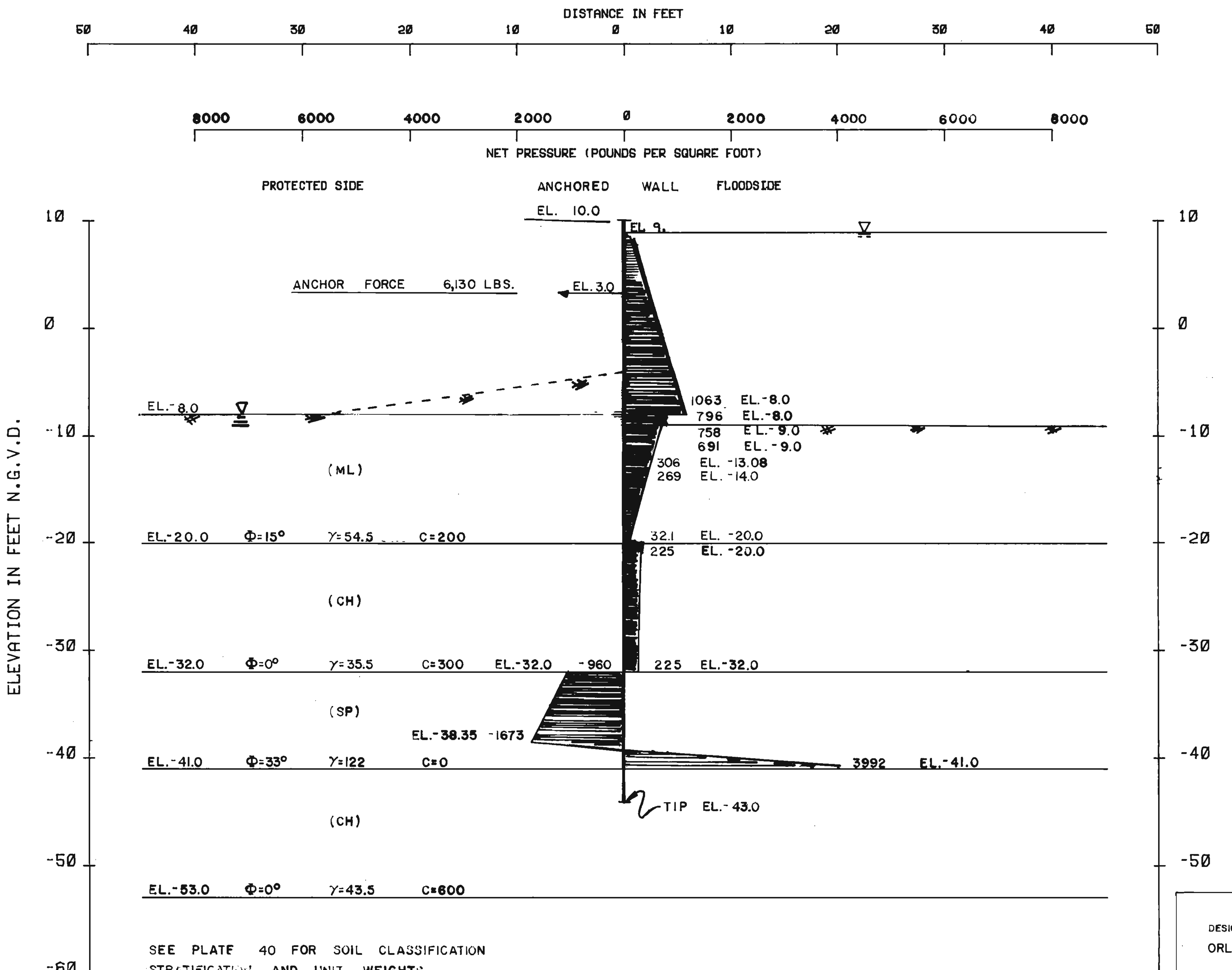
ELEVATION	PRESSURE
9.00	0.0
0.00	562.5
0.00	189.2
-4.67	0.0
-8.00	-134.9
-8.00	-218.3
-8.82	-282.3
-8.82	-247.0
-20.00	-689.1
-20.00	-770.8
-21.96	-770.8
-22.00	-758.0
-22.00	-739.7
-22.05	-739.5
-24.26	0.0
-29.71	1830.4
-29.71	0.0

SEE PLATE 40 FOR SOIL CLASSIFICATION STRATIFICATION, AND UNIT WEIGHT SEE PLATE 72 FOR STABILITY ANALYSIS.

NET DIAGRAM

(Q) CASE F.S.=1.5

LAKE PONTCHARTRAIN, LA. AND VICINITY
HIGH LEVEL PLAN
DESIGN MEMORANDUM NO. 19 GENERAL DESIGN
ORLEANS AVENUE OUTFALL CANAL
I-WALL ANALYSIS
VALVE STRUCTURE EXCAVATION
U.S. ARMY ENGINEER DISTRICT, NEW ORLEANS
CORPS OF ENGINEERS
JUNE 1988 FILE NO. H-2-30290



ELEVATION	PRESSURE
9.00	0.0
3.00	375.0
-0.82	0.0
-8.00	-704.7
-8.00	-1504.9
-8.67	-1571.1
-9.00	-1364.1
-9.00	-802.9
-9.76	-877.8
-11.14	0.0
-14.42	2004.5
-14.42	0.0

SEE PLATE 40 FOR SOIL CLASSIFICATION STRATIFICATION, AND UNIT WEIGHTS

NOTE: FOR A F.S. = 1.0 THE CORRESPONDING ANCHOR FORCE IS 6,130 LBS/LF

SEE PLATE 68 FOR STABILITY ANALYSIS.

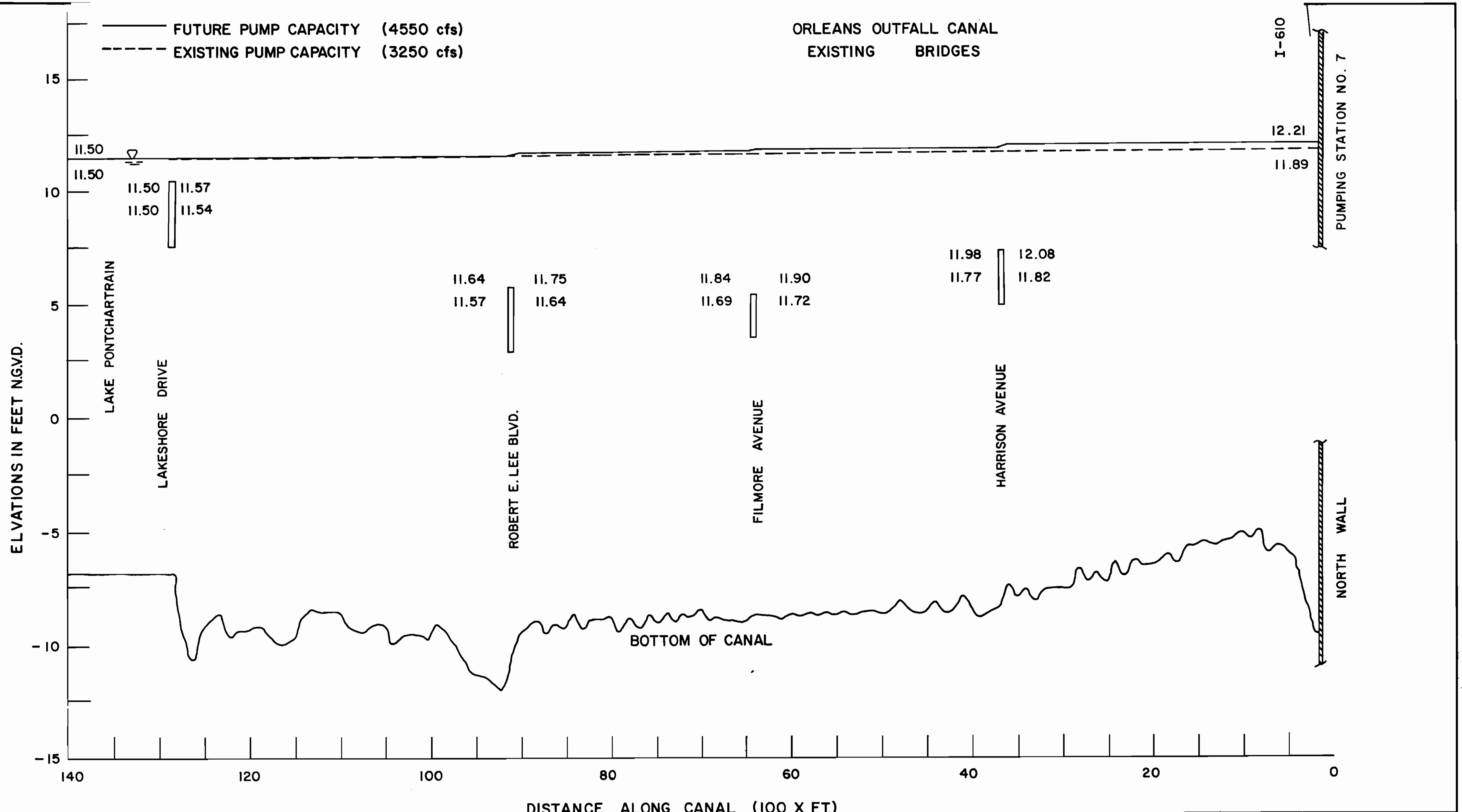
NET DIAGRAM

(Q) CASE F.S.=1.5

LAKE PONTCHARTRAIN, LA. AND VICINITY
HIGH LEVEL PLAN
DESIGN MEMORANDUM NO. 19 GENERAL DESIGN
ORLEANS AVENUE OUTFALL CANAL

BRACED WALL ANALYSIS
VALVE STRUCTURE EXCAVATION

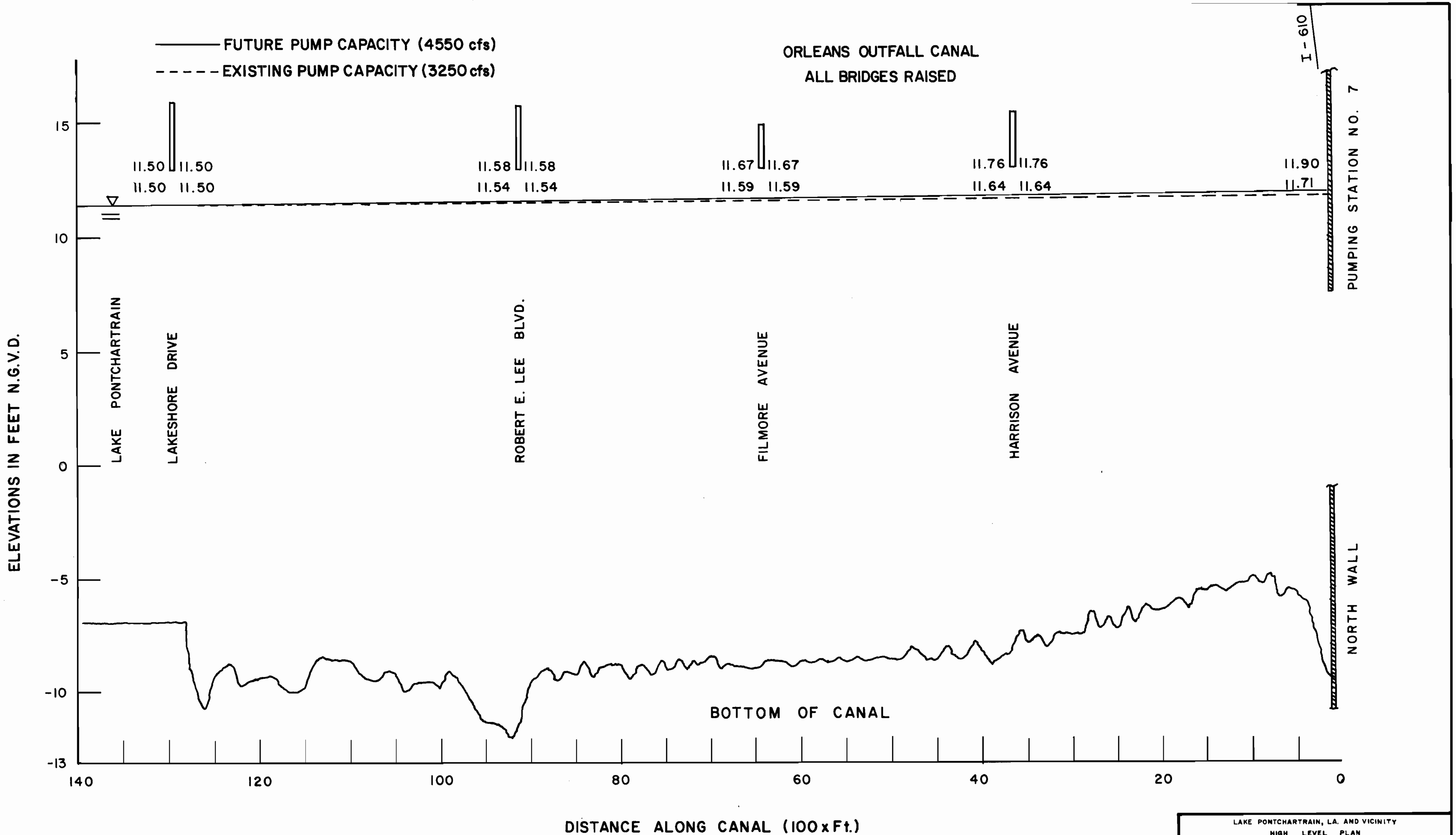
U.S. ARMY ENGINEER DISTRICT, NEW ORLEANS
CORPS OF ENGINEERS
JUNE 1988 FILE NO. H-2-30290



LAKE PONTCHARTRAIN, LA. AND VICINITY
HIGH LEVEL PLAN
DESIGN MEMORANDUM NO. 19 GENERAL DESIGN
ORLEANS AVENUE OUTFALL CANAL

WATER SURFACE PROFILE NO. 1

U. S. ARMY ENGINEER DISTRICT, NEW ORLEANS
CORPS OF ENGINEERS
JUNE, 1988 FILE NO. H-2-30290

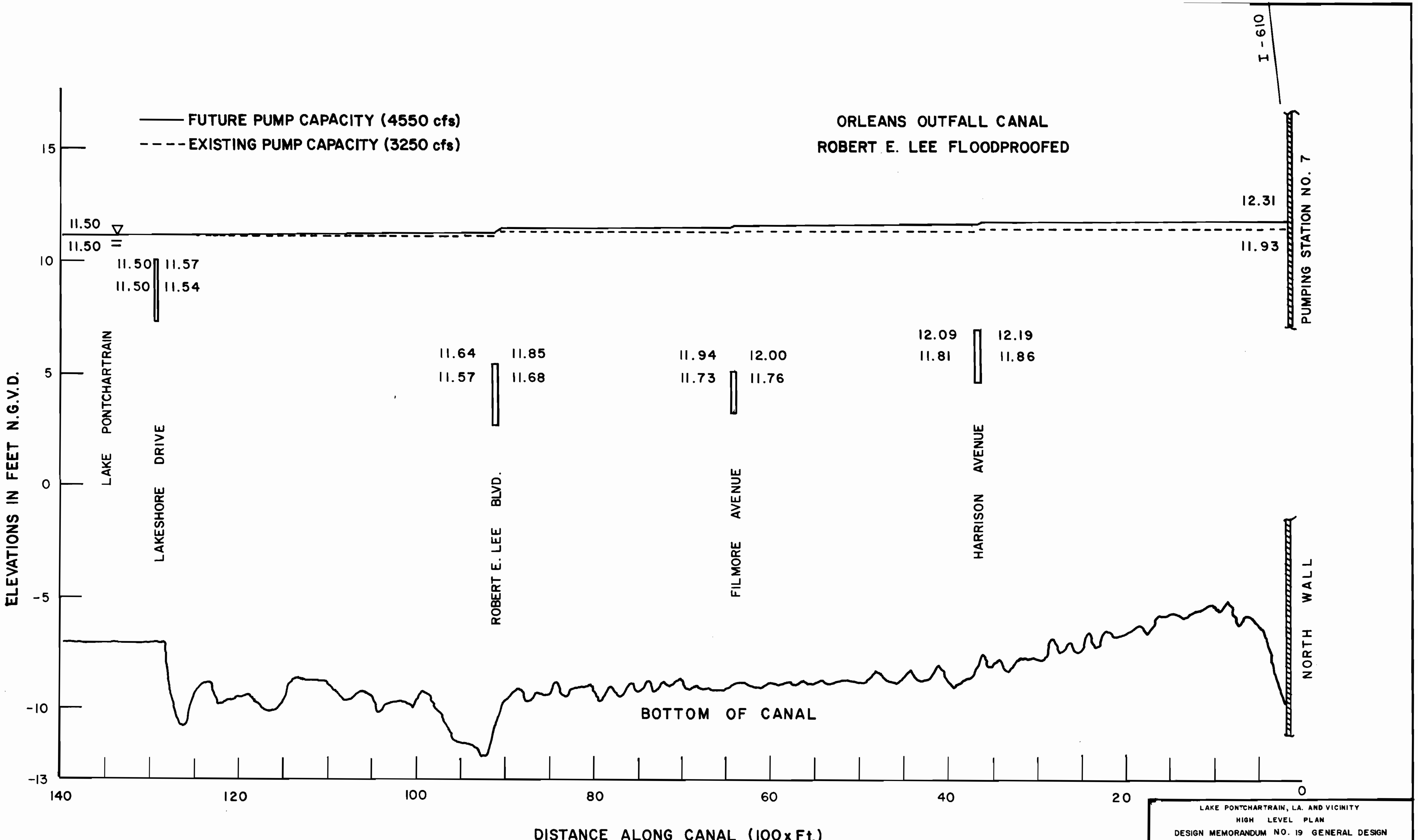


LAKE PONTCHARTRAIN, LA. AND VICINITY
HIGH LEVEL PLAN
DESIGN MEMORANDUM NO. 19 GENERAL DESIGN
ORLEANS AVENUE OUTFALL CANAL

WATER SURFACE PROFILE NO. 2

U. S. ARMY ENGINEER DISTRICT, NEW ORLEANS
CORPS OF ENGINEERS
JUNE, 1988 FILE NO. H-2-30290

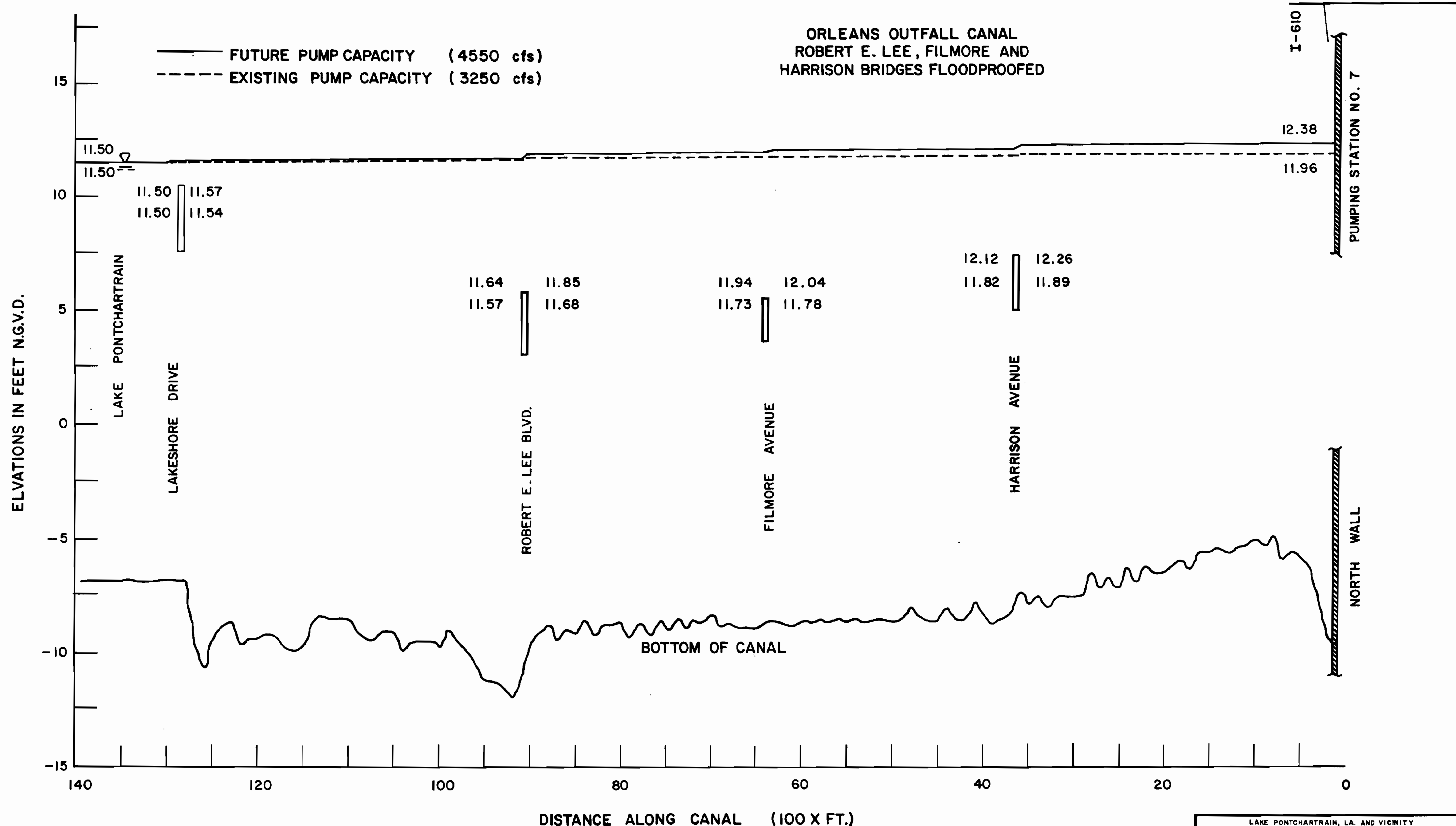
PLATE 98



LAKE PONTCHARTRAIN, LA. AND VICINITY
HIGH LEVEL PLAN
DESIGN MEMORANDUM NO. 19 GENERAL DESIGN
ORLEANS AVENUE OUTFALL CANAL

WATER SURFACE PROFILE NO. 3

U.S. ARMY ENGINEER DISTRICT, NEW ORLEANS
CORPS OF ENGINEERS
JUNE, 1988 FILE NO. H-2-30290

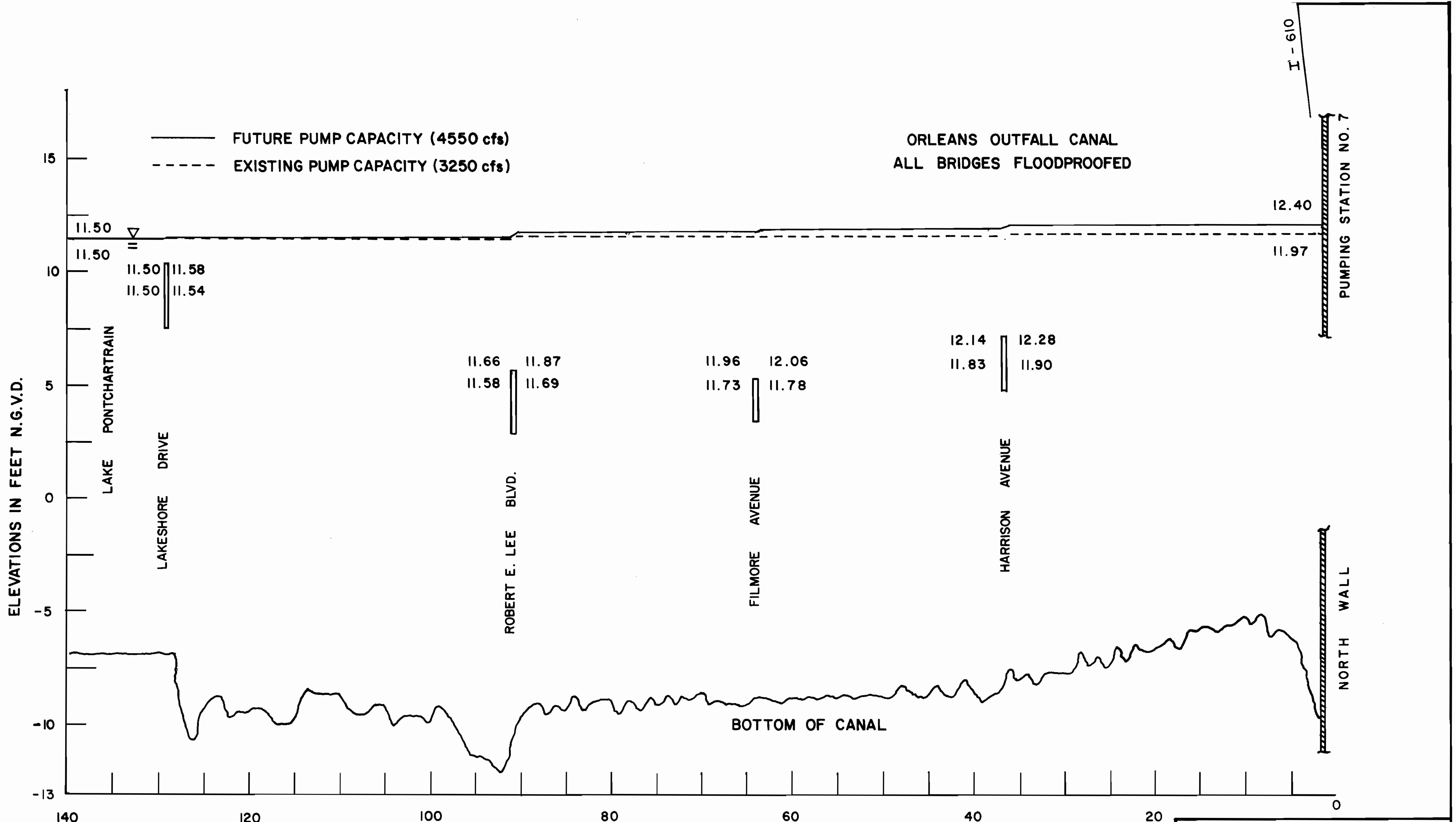


LAKE PONTCHARTRAIN, LA. AND VICINITY
HIGH LEVEL PLAN
DESIGN MEMORANDUM NO. 19 GENERAL DESIGN
ORLEANS AVENUE OUTFALL CANAL

WATER SURFACE PROFILE NO. 4

U.S. ARMY ENGINEER DISTRICT, NEW ORLEANS
CORPS OF ENGINEERS
JUNE, 1988 FILE NO. H-2-30290

PLATE 100



LAKE PONTCHARTRAIN, LA. AND VICINITY
HIGH LEVEL PLAN
DESIGN MEMORANDUM NO. 19 GENERAL DESIGN
ORLEANS AVENUE OUTFALL CANAL

WATER SURFACE PROFILE NO. 5

U.S. ARMY ENGINEER DISTRICT, NEW ORLEANS
CORPS OF ENGINEERS
JUNE, 1988 FILE NO. H-2-30290

PLATE 101

UNIFIED SOIL CLASSIFICATION

MAJOR DIVISION		TYPE	LETTER SYMBOL	SYMBOL	TYPICAL NAMES
COARSE - GRAINED SOILS More than half of material is larger than No 200 sieve size	GRAVELS More than half of coarse fraction is larger than No 4 sieve size	CLEAN GRAVEL (Little or No Fines)	GW		GRAVEL, Well Graded, gravel-sand mixtures, little or no fines
			GP		GRAVEL, Poorly Graded, gravel-sand mixtures, little or no fines
		GRAVEL WITH FINES (Appreciable Amount of Fines)	GM		SILTY GRAVEL, gravel-sand-silt mixtures
			GC		CLAYEY GRAVEL, gravel-sand-clay mixtures
	SANDS More than half of coarse fraction is smaller than No 4 sieve size	CLEAN SAND (Little or No Fines)	SW		SAND, Well-Graded, gravelly sands
			SP		SAND, Poorly-Graded, gravelly sands
		SANDS WITH FINES (Appreciable Amount of Fines)	SM		SILTY SAND, sand-silt mixtures
			SC		CLAYEY SAND, sand-clay mixtures
FINE - GRAINED SOILS More than half the material is smaller than No. 200 sieve size		SILTS AND CLAYS (Liquid Limit < 50)	ML		SILT & very fine sand, silty or clayey fine sand or clayey silt with slight plasticity
			CL		LEAN CLAY; Sandy Clay; Silty Clay; of low to medium plasticity
			OL		ORGANIC SILTS and organic silty clays of low plasticity
		SILTS AND CLAYS (Liquid Limit > 50)	MH		SILT, fine sandy or silty soil with high plasticity
			CH		FAT CLAY, inorganic clay of high plasticity
			OH		ORGANIC CLAYS of medium to high plasticity, organic silts
HIGHLY ORGANIC SOILS			Pt		PEAT, and other highly organic soil
WOOD			Wd		WOOD
SHELLS			SI		SHELLS
NO SAMPLE					

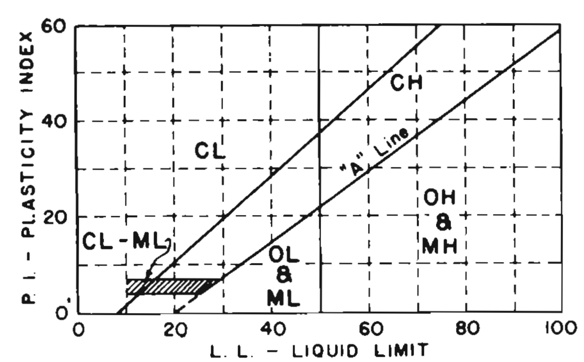
NOTE: Soils possessing characteristics of two groups are designated by combinations of group symbols

DESCRIPTIVE SYMBOLS

COLOR	SYMBOL
TAN	T
YELLOW	Y
RED	R
BLACK	BK
GRAY	Gr
LIGHT GRAY	lGr
DARK GRAY	dGr
BROWN	Br
LIGHT BROWN	lBr
DARK BROWN	dBr
BROWNISH-GRAY	br Gr
GRAYISH-BROWN	gy Br
GREENISH-GRAY	gn Gr
GRAYISH-GREEN	gy Gn
GREEN	Gn
BLUE	Bl
BLUE-GREEN	Bl Gn
WHITE	Wh
MOTTLED	Mot

CONSISTENCY FOR COHESIVE SOILS

CONSISTENCY	COHESION IN LBS./SQ.FT. FROM UNCONFINED COMPRESSION TEST	SYMBOL
VERY SOFT	< 250	vSo
SOFT	250 - 500	So
MEDIUM	500 - 1000	M
STIFF	1000 - 2000	St
VERY STIFF	2000 - 4000	vSt
HARD	> 4000	H



PLASTICITY CHART

For classification of fine - grained soils

MODIFICATIONS

MODIFICATION	SYMBOL
Traces	Tr-
Fine	F
Medium	M
Coarse	C
Concretions	cc
Rootlets	rt
Lignite fragments	lg
Shale fragments	sh
Sandstone fragments	sds
Shell fragments	slf
Organic matter	O
Clay strata or lenses	CS
Silt strata or lenses	SIS
Sand strata or lenses	SS
Sandy	S
Gravelly	G
Boulders	B
Slickensides	SL
Wood	Wd
Oxidized	Ox

NOTES:

FIGURES TO LEFT OF BORING UNDER COLUMN "W OR D_{10}"

Are natural water contents in percent dry weight

When underlined denotes D_{10} size in mm *

FIGURES TO LEFT OF BORING UNDER COLUMNS "LL" AND "PL"

Are liquid and plastic limits, respectively

SYMBOLS TO LEFT OF BORING

∇	Ground-water surface and date observed
C	Denotes location of consolidation test **
S	Denotes location of consolidated-drained direct shear test **
R	Denotes location of consolidated-undrained triaxial compression test **
Q	Denotes location of unconsolidated-undrained triaxial compression test **
T	Denotes location of sample subjected to consolidation test and each of the above three types of shear tests **
FW	Denotes free water encountered in boring or sample

FIGURES TO RIGHT OF BORING

Are values of cohesion in lbs./sq. ft. from unconfined compression tests

In parenthesis are driving resistances in blows per foot determined with a standard split spoon sampler ($1\frac{3}{8}$" I.D., 2" O.D.) and a 140 lb. driving hammer with a 30" drop

Where underlined with a solid line denotes laboratory permeability in centimeters per second of undisturbed sample

Where underlined with a dashed line denotes laboratory permeability in centimeters per second of sample remoulded to the estimated natural void ratio

* The D_{10} size of a soil is the grain diameter in millimeters of which 10% of the soil is finer, and 90% coarser than size D_{10}.

**Results of these tests are available for inspection in the U.S. Army Engineer District Office, if these symbols appear beside the boring logs on the drawings.

GENERAL NOTES:

While the borings are representative of subsurface conditions at their respective locations and for their respective vertical reaches, local variations characteristic of the subsurface materials of the region are anticipated and, if encountered, such variations will not be considered as differing materially within the purview of clause 4 of the contract.

Ground-water elevations shown on the boring logs represent ground-water surfaces encountered in such borings on the dates shown. Absence of water surface data on certain borings indicates that no ground-water data are available from the boring, but does not necessarily mean that ground water will not be encountered at the locations or within the vertical reaches of such borings.

Consistency of cohesive soils shown on the boring logs is based on driller's log and visual examination and is approximate, except within those vertical reaches of the borings where shear strengths from unconfined compression tests are shown.

REVISION	DATE	DESCRIPTION	BY
4	2-10-84	2nd Para. General Notes Revised	LMNED-GS Let. dated 12 Dec. 83
3	5-3-71	ADDED UPPER LIMIT LINE (PI=0.9(LL-8)) ON PLASTICITY CHART	LMVED-G LETTER DTD 29 APRIL 1971
2	6-8-64	SYMBOL FW, NOTE REVISED	ORAL FROM LMVGG 5 JUNE 1964
1	9-17-63	1ST PAR OF GENERAL NOTES REVISED	LMVD MULTIPLE LETTER, DATED 5 SEPT. 1963

SOIL BORING LEGEND

U S ARMY ENGINEER DISTRICT, NEW ORLEANS
CORPS OF ENGINEERS
FILE NO. H-2-21800

LAKE PONTCHARTRAIN, LOUISIANA AND VICINITY
HIGH LEVEL PLAN
DESIGN MEMORANDUM NO.19, GENERAL DESIGN
ORLEANS AVENUE OUTFALL CANAL

APPENDIX A

A-1 ENVIRONMENTAL ASSESSMENT - FONSI
A-2 U.S. FISH AND WILDLIFE COORDINATION ACT LETTER
A-3 LETTER CITY OF NEW ORLEANS DEPT. OF STREETS

ENVIRONMENTAL ASSESSMENT - FONSI

APPENDIX A-1

<u>Environmental Assessment</u>

Lake Pontchartrain, Louisiana, and Vicinity
Hurricane Protection Project, Orleans Avenue
Outfall Canal,

INTRODUCTION

The Lake Pontchartrain, Louisiana, and Vicinity Hurricane Protection project was initially authorized by Public Law 89-298, 27 October 1965 as a "barrier" plan of hurricane protection. An environmental impact statement (EIS) was prepared on the original project and filed with the Council on Environmental Quality in January 1975. Subsequently a court ordered reevaluation was undertaken. The resultant reevaluation recommending a high level plan of hurricane protection was addressed in Supplement I to the final environmental impact statement (FEIS) filed with the Environmental Protection Agency in December 1984. The approval of the high level plan was granted in 1985 with the signing of the Record of Decision.

However, at the time the FEIS was prepared, the designs for providing hurricane protection for the lakefront outfall canals were unresolved. Presently, the high level plan of hurricane protection is under construction and the design for the protection at the Orleans Avenue Outfall Canal is completed.

This Environmental Assessment (EA) will evaluate two alternative methods of providing hurricane protection to the Orleans Avenue Outfall Canal. The U.S. Army Corps of Engineers (Corps) is recommending protection utilizing a "butterfly valve" structure while the local assurers (Orleans Levee Board) desire to build a system of parallel protection by raising the existing levees adjacent to the canal.

NEED

The Orleans Avenue Outfall Canal provides interior drainage for the City of New Orleans by moving water from the central city to Lake Pontchartrain. Protection from hurricane-induced tidal inundation via the lake/canal connection is presently achieved by locally-constructed parallel protection levees adjacent to the canal. The existing levees along the canal do not meet the design height or sectional stability required for the Lake Pontchartrain project under either the previously authorized barrier or the more recently authorized high level plan. Since the portion of New Orleans adjacent to the canal is well below sea level, protection from a hurricane surge overtopping the levee is necessary to eliminate the risk of interior flooding.

PROJECT DESCRIPTION AND LOCATION

The project area is located in southeastern Louisiana on the south side of Lake Pontchartrain in Orleans Parish (Plate 1).

Hurricane Protection for the Orleans Avenue Outfall Canal can be achieved by two basic concepts. One concept is to provide fronting protection at or near the lakefront end of the canal. This fronting protection structure would have a specialized "butterfly" type valve. The structure consists of four 28 x 16-foot gated bays that automatically open or close as the flow changes. As long as the direction of flow is toward the lake, the gate would remain open. During a hurricane event, when the lake elevation rises enough to reverse the direction of flow, the gates would automatically close. This structure and appurtenant floodwall would be connected to the existing lakefront levee so that once closed, a continuous line of protection could be achieved. A cofferdam would be built in the canal so the closure could be constructed in the dry. A bypass would be built around the cofferdam so flows would not be interrupted. This is the plan that is recommended by the Corps because it is the most cost effective way to provide hurricane protection, can be designed to fully accomodate interior drainage, and would be the least disruptive method to protect areas behind the levees.

A second concept requires upgrading the existing lateral protection provided by levees paralleling the 2.6-mile the canal on either side. This plan would require bridges at Robert E. Lee Boulevard, Filmore Street, and Harrison Avenue to be modified or floodproofed since their respective deck elevations are below grades required to achieve project protection. Means to achieve positive closure at pumping station number 7, located at the southern end of the canal, must be incorporated into this plan. Both plans will be addressed in this EA., however, the parallel protection plan is the choice of the Orleans Levee Board and most likely to be constructed.

Any borrow material required for use in conjunction with either alternative would be taken from the Corps-approved borrow site in the Bonnet Carre' Spillway.

SIGNIFICANT RESOURCES

The following resources are considered significant because of their ecological, esthetic, or cultural attributes and their institutional, technical, or public recognition.

ENVIRONMENTAL SETTING

FISH AND WILDLIFE RESOURCES

Existing Conditions

The Orleans Avenue Outfall Canal is a man-made canal approximately 2.6 miles in length, with average bottom and top widths of 100 to 160 feet, paralleled by a levee on the entire east side, by a floodwall on the west side between the pumping station and Robert E. Lee Boulevard, and by a levee on the west side near the lake. The canal is oriented in a north/south direction between Lake Pontchartrain and Interstate 10 (see Plate 1). The existing levee is frequently mowed. Predominant vegetation on the levee and adjacent rights-of-way includes perennial grasses, herbs, ornamental shrubs, and various trees including pine, hackberry, and oak. Due to human disturbance and vegetative structure, the levee and surrounding rights-of-way do not provide high quality wildlife habitat. Some use of shrubs and trees by squirrels and songbirds occurs. The canal is lined in some areas with marsh grasses, which provide limited cover, feeding, and resting habitat for various songbirds, seabirds, and some ducks. Least terns and seagulls are commonly seen feeding on the canal.

The water quality in the Orleans Avenue Outfall Canal is generally poor; therefore, the canal has minimal value as habitat for fishery resources. The canal itself receives pumped storm water runoff from Metropolitan New Orleans. Typical contaminants present in the canal include oils, other petroleum hydrocarbons, pesticides, fertilizers, heavy metals, salts, combustion hydrocarbons and acids, plasticizers, oxygen-demanding waste, sediment, and raw domestic sewerage (Schurtz and St. Pe' 1984). Organic chemicals and heavy metals are the toxicants of most concern which affect aquatic life in the canal and nearshore vicinity.

The nearshore lake area adjacent to the canal provides moderate value nursery and feeding habitat for estuarine-dependent commercial and sport finfishes and shellfishes. Some fishery use of the canal exists. The marsh grasses that fringe portions of the canal provide nursery habitat. Due to the poor water quality, the benthos of the canal is limited to worms, blue crabs, clams, and gastropods. The benthic community is more diverse near the lake. Most benthic species in the area are tolerant of prolonged periods of low dissolved oxygen and are not the benthics primarily utilized as fish food organisms by economic and commercially important fish species.

Future Without Project

Fish and Wildlife resources would remain as they are at present.

Butterfly Valve Alternative Impacts

Placement of this structure would result in the loss of 3 acres of marginal benthic habitat associated with the canal bottom. During fill placement associated with structure installation, organisms such as crabs would be able to escape burial, while most sessile or slow moving organisms such as clams would be lost. Turbidities associated with the fill placement would result in temporary reductions in primary production. Water quality within the project area would be adversely affected due to increase in turbidity, reductions in dissolved oxygen, and resuspension of contaminated sediments in the water column. There would be only minimal temporary interference with normal canal/lake interchange during the period of construction. Various estuarine fish species inhabiting this aquatic environment have the mobility to avoid the direct adverse impacts; however, the localized benthic and planktonic food supplies would be temporarily reduced.

Secondary, indirect impacts may result near the canal mouth and adjacent nearshore waters of Lake Pontchartrain. Increases in turbidity accompanied by decreased oxygen associated with the construction may be encountered by various aquatic species including shrimp, crab, drum, and flounder that use these nearshore waters for limited feeding and nursery areas.

Terrestrial impacts associated with the alternative are minimal and would involve the loss of approximately 0.13 acres of upland developed area adjacent to the Orleans Avenue Outfall Canal south of Lakeshore Drive. The impacted area is primarily grassed levees which provide minimal wildlife usage.

Placement and handling of any contaminated dredged material from the canal bottom could cause potential sources of pollution if not contained in a properly secured site. If this alternative is chosen, a Section 404(b)(1) Evaluation will be prepared to address these concerns.

Parallel Protection Alternative Impacts

Approximately 15 acres of low value wildlife habitat including 162 trees (45 of which are oaks) would be impacted by degrading, earth moving, and shaping operations. The loss of mature trees would remove them from the ecosystem until the replacement trees mature. Ten young oaks would be planted for every mature tree taken. Three young pines would replace each mature pine. The new levee would provide habitat similar to the existing levee.

Temporary displacement of habitat for songbirds and tree dwelling animals would occur in association with tree removal. While these trees will be replaced, habitat in the immature trees would be of only moderate value for some species. This impact would only be short term. In the long term, habitat for tree dwellers would be increased.

In addition, approximately 2 acres of marsh grass and associated fishery habitat would be affected by degrading and upgrading the existing levee. Runoff during construction would slightly increase turbidity in the canal and the amount of airborne dust in the project area. Once the levee becomes vegetated, this impact would be eliminated.

ENDANGERED SPECIES

Existing Conditions

No threatened or endangered species or their critical habitat is found in the project area.

Future Without and Both Alternatives

No impact on endangered species.

RECREATION

Existing Conditions

Recreational opportunities abound in the vicinity. The levee is used by joggers, walkers, bird watchers, and fishermen. Very little bank fishing occurs along the canal south of Robert E. Lee Boulevard. Some limited fishing, crabbing, and pleasure boating takes place in the 1.2 miles of the canal between Robert E. Lee Boulevard and the lake. The adjacent park provide areas for field sport activities, picnicking, and similar activities. The New Orleans Recreational Department operates the Gernon Brown Memorial Recreational Center adjacent to the levee at Harrison Avenue. This building is used for indoor games, recreation, and community activities.

Future Without Project

Recreational resources will remain as they are at present.

Butterfly Valve Alternative Impacts

Construction of the cofferdam and the structure would interrupt the minimal fishing and crabbing activities that occur in the bayou mouth. Noise during construction could temporarily disrupt the minimal bird-watching activities that occur at the present. With the structure in place, boat access to 0.4 miles of canal south of the structure will be blocked. This is not considered detrimental due to the minimal use of the canal for boating. The completed structure would have essentially no overall impact on recreation.

Parallel Protection Alternative Impacts

All use of the five miles of earthen levee would be disrupted during construction. Once the protection is completed, there would be only 0.75 miles of earthen levee remaining (north of Robert E. Lee Boulevard and west of the canal). When revegetated, this levee would support recreational activities similar to those occurring now, although on a levee that is 3-4 feet higher than the present levee. The remainder would be floodwall. This floodwall would restrict pedestrian access to the water along most of the canal. Because of their height, these floodwalls will provide a visual as well as a physical barrier to recreationalists wishing to approach the waters edge.

ESTHETICS

Existing Conditions

As described above, two-thirds of the canal corridor is bounded by green spaces with an esthetically pleasing mixture of grass, oaks, and pines. The trees add to the scenic beauty and provide shade for various recreational activities. The levee on the east side provides a green backdrop screening the view of the neighborhood beyond.

City Park, a large municipal park, is immediately adjacent to the east protection levee. This park provides a large tract of minimally developed land dominated with large mature trees (oak, pine, etc.) intermixed with large green spaces, ponds, and waterways.

Future Without Project

Esthetics would remain as they are at present.

Butterfly Valve Alternative Impacts

Initial construction would result in increasing levels of noise and dust in the area of work. After the structure is completed, the tie-in levee will be revegetated and soon return to its preproject esthetic condition. The upper portion of the structure will be evident from the both sides of the canal. This structure is relatively small in size and impacts are not considered significant.

Parallel Protection Alternative Impacts

Increasing the height of 0.75 miles of earthen levee, replacement of 2.6 miles earthen levee with floodwall, and replacement of 1.85 miles of floodwall would cause significant impacts to the esthetic environment. Approximately 162 trees would be removed and some smaller trees would be relocated. Trees would be replaced as described earlier. In places where floodwalls replace an earthen levee, a visual barrier would be evident in an area that traditionally has been a green space. This wall could be esthetically unattractive if measures are not implemented to soften the adverse visual impacts. Surface treatment such as exposed aggregate, three dimensional features, and earth tone paint would minimize and partially mitigate adverse visual impacts.

CULTURAL

Existing Conditions

The project area includes an existing levee corridor on post-1930 reclaimed land and the artificial channel of the Orleans Avenue Outfall Canal. No cultural resources are recorded in the vicinity of the proposed work.

Future Without Project

Same as existing conditions.

Butterfly Valve Alternative Impacts

No impacts to significant cultural resources are anticipated and no cultural surveys are warranted.

Parallel Protective Alternative Impacts

No impacts on significant cultural resources are anticipated and no cultural resource surveys are warranted.

NOISE

Existing Conditions

The background noise levels for the project area are approximated to range from 70 dBA in the project reaches located in residential areas on the west side, south of Robert E. Lee Boulevard to 50 dBA in the quieter park-like residential areas north of Robert E. Lee and in City Park itself. Edward Hayne Elementary School lies just west of the floodwall at Harrision Avenue.

Future Without Project

There would be no noise associated with construction.

Butterfly Valve Alternative Impacts

Installation of this structure would require several construction stages including pile driving, backfilling, slab construction, and finishing work. The greatest source of noise will be the pile driving activity which is to be performed in a noncontinuous fashion for approximately 108, 10-hour days.

The greatest exposure would be encountered in the park adjacent to the construction. Exposure levels here would range from 95-105 DBA. This level of noise intrusion would interfere with passive recreation such as pleasure walking, picnicking, bird watching, etc. In addition, some interference with oral communication could be expected near the construction site.

Residences within the project area would be exposed to noise levels ranging from 77-95 dBA for 108 days depending on the distance from the source. Approximately four houses would be exposed to 89-95 dBA, 11 to 83-89, dBA and 48 to 77-83 dBA. These are exterior noise levels; interior noise exposure should be less. Vibrations resulting from the pile driving operation encountered by approximately 20 residences 200-400 feet from the source should be minimal. While these vibrations may be annoying to these residences, the potential for vibration-induced structural damage should be minimal.

The remaining activities, including slab construction (72 days), backfill operation (10 days), and finishing work (10 days), would produce heightened noise levels ranging from 63-95 dBA. Four homes would be exposed to 76-95 dBA, 11 to 70-89 dBA, and 48 to 63-83 dBA. These are exterior noise levels; the interior exposure to noise would be less.

Parallel Protection

This method of construction results in increases in noise levels produced from degrading and upgrading existing levees and floodwalls. The noise levels expected would range from 95-105 dBA when measured 50 feet from the center of the noise source. Portions of the Hayne Elementary school would be exposed to this level of noise; however, no homes would be within this range. Some disruption of classes is expected, especially during the 7 days when levels are 95-105 dBA (See Table 1). Approximately 168 residences would be exposed to noise levels ranging from 77-95 dBA. Approximately 168 residences would be exposed to 77-83 dBA. Ambient noise level for the area is 50-70 dBA. Table 1 outlines the number of days a particular residence would be exposed to a noise level.

Construction workers would have protective hearing devices. Since construction would take place during daylight hours, sleep interference should occur only for napping children and day sleepers. Noise mainly affects bodily functions (hearing rate, respiratory volume, digestive secretions, hormonal secretions, etc.). If prolonged, the construction noise levels could produce significant physiological damage. However, the relatively short duration of the noise should prevent such problems from occurring. The noise could be annoying to inhabitants of the 20 residences within the 400 feet of the actual work site. During the time the noise was higher than 85 dBA, it could be difficult to hold a conversation within the impacted house and recreational areas.

Table 1
Noise Exposure for Floodwalls (days)

Distance (feet)	Buildings (number)		Decibels 95-105	89-95	83-89	77-83
0-50	1	green space, public school	7	7	14	27
50-100	81	residences	-	10	16	28
100-200	87	residences	-	-	21	32
200-400	93	residences	-	-	-	42

Therefore, during construction the noise levels would increase a maximum of 35-45 dBA above ambient. This level of increase is not expected to interfere with residential activity since most of the work will be done during daylight hours and exposure levels inside the homes would be further reduced.

COMMUNITY COHESION

Existing Conditions

The residents of Orleans Parish are in favor of protection provided by the hurricane protection project and have voted for a bond issue which assists in funding the work.

Future Without the Project

The area adjacent to the canal would be subject to flooding from the canal during hurricanes.

Butterfly Valve Alternative Impacts

This alternative would provide the necessary flood protection. Disruption in localized traffic patterns, recreational activities, and esthetics would be sporadic and fairly short term. The initial movement of equipment onto and off of the site would account for the major portion of the traffic increase. Some occasional heavy traffic would be encountered when fill material is truck-transported onto the site and dredged material is being transported off site. Since fill requirements are minimal, traffic patterns should be normal during the majority of the work.

Parallel Protection Alternative Impacts

This alternative would provide the necessary flood protection. Disruption in traffic patterns would be much greater with this alternative due to the fill requirements and the widespread use of pile driving equipment. Recreational activities would be disrupted for long periods of time as would the esthetics in the area. Increased levels of noise would be expected during the entire two-year construction period somewhere along canal from the lakefront to Interstate 10. This method of construction is not localized to a specific area like the construction of the butterfly valve.

MITIGATION

Because of the low habitat quality of the construction site and the minimal habitat effected, no wildlife mitigation is proposed. In order to minimize potential impacts, turbidity screens would be used during dredging and construction activities which are likely to resuspend sediment. Dredged material from the canal bottom should be transported in trucks equipped with leak-proof liners and transported to state approved upland disposal sites. To minimize noise associated problems, pile driving will be limited to daylight hours.

COMPLIANCE WITH ENVIRONMENTAL LAWS

Compliance with the Endangered Species Act has been achieved. Cultural compliance has been achieved. If parallel protection is chosen, no Section 404(b)(1) Evaluation or Coastal Zone Management Consistency Determination would be necessary. If the butterfly valve alternative is chosen, both of these documents would need to be prepared.

COORDINATION

Copies of this EA will be distributed to the parties shown in Table 2.

Literaure Cited

Schurtz, M. H. and K. M. St. Pe'. 1984. Report on Interim Findings: water quality Investigation of environmental conditions in Lake Pontchartrain. Louisiana Department of Environmental Quality. Water Pollution Control Division, Baton Rouge.

CONCLUSION

The U.S. Army Corps of Engineers, New Orleans District, proposes to provide flood protection to areas adjacent to the Orleans Avenue Outfall Canal by construction of a butterfly-valved structure north of Robert E. Lee Boulevard. Impacts to fish and wildlife resources, recreation, endangered species, cultural resources, esthetics, noise, and community cohesion would be minimal with this plan. The Orleans Levee Board prefers the more costly alternative of providing parallel protection by raising levees and floodwall along the entire 2.6-mile canal. Most impacts will be similar to the butterfly valve, but noise would be greater and community cohesion would be more adversely impacted with parallel protection.

Jam Hartzog
Prepared by:

18 July 1988
Date:

John C. Weber 18 Jul 88
Reviewed by:

TABLE 2

LAKE PONTCHARTRAIN, LA, AND VICINITY EA MAILING LIST

CONGRESSIONAL

Honorable J. Bennett Johnston
Honorable John B. Breaux
Honorable Lindy Boggs
Honorable Billy Tauzin
Honorable Robert L. Livingston

FEDERAL

U.S. Department of Commerce
Washington, D.C.

National Marine Fisheries Service
St. Petersburg, FL
Baton Rouge, LA

U.S. Environmental Protection Agency
Dallas, TX

Gulf of Mexico Fisheries Mgmt. Coun.
Tampa, FL

U.S. Dept. of Housing and Urban Devel.
Ft. Worth, TX

U.S. Dept. of the Interior
Washington, D.C.

U.S. Fish and Wildlife Service
Lafayette, LA

Federal Highway Administration
Baton Rouge, LA

U.S. Coast Guard
New Orleans

Advisory Council on Historic Preserv.
Golden, CO
Washington, D.C.

STATE

State Historic Preservation Officer

Department of Environmental Quality
Water Pollution Control Division

STATE (Cont'd)

Department of Natural Resources
Office of Environmental Affairs
Coastal Resources Program

Department of Transportation
Office of Public Program

Department of Wildlife
and Fisheries
Secretary
Ecological Studies Section
Natural Heritage Program

LOCAL

Orleans Levee Board

East Jefferson Levee Board

Pontchartrain Levee Board

Lake Borgne Levee Board

City of New Orleans
City Planning Commission
City Council
Mayor

Regional Planning Commission

St. Charles Parish Council

St. Bernard Parish Police Jury

Plaquemines Parish Commission
Council

St. Tammany Parish Police Jury

City of Mandeville

ENVIRONMENTAL

Orleans Audubon Society

Environmental Defense Fund

ENVIRONMENTAL (Cont'd)

League of Women Voters of Louisiana

Louisiana Wildlife Federation

Delta Chapter, Sierra Club

Bonnet Carre' Rod and Gun Club

Tulane Law School

St. Charles Environmental Council

OTHERS

Hayne Elementary School

DEPARTMENT OF THE ARMY
NEW ORLEANS DISTRICT, CORPS OF ENGINEERS
P.O. BOX 60267
NEW ORLEANS, LOUISIANA 70160-0267

REPLY TO
ATTENTION OF:

Planning Division
Environmental Analysis Branch

FINDING OF NO SIGNIFICANT IMPACT

Lake Pontchartrain, Louisiana, and Vicinity Hurricane Protection Project

ORLEANS AVENUE OUTFALL CANAL - FLOOD PROTECTION

Description of Action. The U.S. Army Corps of Engineers, New Orleans District, has studied alternative methods of providing high level flood protection for the Orleans Avenue Outfall Canal. The Corps recommends the placement of a structure (butterfly valve) in the canal itself. However, the Orleans Levee Board proposes raising existing levees along the canal, thus providing parallel protection.

Factors Considered in Determination. The following factors were considered in determining that the proposed action would cause no significant impact: fisheries, wildlife, cultural resources, endangered species, noise, community cohesion, esthetics and recreation.

Public Involvement. The EA was circulated to interested parties in July 1988.

Conclusion. The office has assessed the environmental impact of both of the proposed actions and has determined that neither would have significant impact upon the human environment. Therefore, no Environmental Impact Statement will be prepared. The Corps recommends the butterfly valve alternative because it is the more cost effective and less disruptive approach to providing flood protection that will meet specifications of the High Level Hurricane Protection Plan.

21 JUL 88
Date

for Harold E. Manuel Jr. LTC, CE
Lloyd K. Brown
Colonel, Corps of Engineers
District Engineer

U.S. FISH AND WILDLIFE COORDINATION ACT LETTER

APPENDIX A-2

United States Department of the Interior

FISH AND WILDLIFE SERVICE

POST OFFICE BOX 4305
103 EAST CYPRESS STREET
LAFAYETTE, LOUISIANA 70502

SEP 30 1987

September 25, 1987

Colonel Lloyd K. Brown
District Engineer
U.S. Army Corps of Engineers
Post Office Box 60267
New Orleans, Louisiana 70160

Dear Colonel Brown:

Reference is made to the General Design Memorandum for the Orleans Avenue Outfall Canal feature of the Lake Pontchartrain, Louisiana, and Vicinity Hurricane Protection Project. The intent of this report is to provide your agency with essential data, assumptions, and information to be used in developing the above-referenced General Design Memorandum. This report is provided as a supplement to the Fish and Wildlife Coordination Act Report which was submitted in July 1984 and attached to the Corps of Engineers (Corps) Main Report and Supplement I to the Environmental Impact Statement for this project. This supplemental report constitutes the report of the Secretary of the Interior as required by Section 2(b) of the Fish and Wildlife Coordination Act (48 Stat. 401, as amended; 16 U.S.C. 661 et seq.) and was prepared in consultation with the Louisiana Department of Wildlife and Fisheries and the National Marine Fisheries Service.

The recommended plan presented in the Corps' July 1984 Main Report and Environmental Impact Statement proposes to rectify deficiencies in the main outfall canals entering Lake Pontchartrain to provide hurricane protection for the Metropolitan New Orleans area. The proposed project includes modification of a major outfall canal on Orleans Avenue which provides interior drainage for a portion of the urban Orleans Parish area.

Presently, two alternatives are under consideration. The first alternative consists of placement of a water control structure recessed within the Orleans Avenue Outfall Canal inland from the outfall at the south shore of Lake Pontchartrain. The water control structure would require partial closure of the canal and installation of a vertical-pivoting butterfly valve gate. The gate would passively allow discharge of the canal waters into Lake Pontchartrain whenever the water level in the canal exceeds that of the lake. Conversely, when lake water levels exceed that of the canal, the gate would automatically close. An undetermined amount of dredging of the canal during construction of the water control structure and closure, levees, and approach channels would occur in conjunction with this proposed alternative.

The second alternative, as identified in the Corps' Main Report and Supplement I to the Environmental Impact Statement for the Hurricane

Protection Project, consists of raising the height of the return levees paralleling the Orleans Avenue Outfall Canal and providing floodgates or road ramps at all existing bridges crossing the canal. The levees would either be widened landward from the canal, or floodwalls would be installed atop the existing levee to achieve the required height for hurricane protection. The amount of dredging associated with the second alternative is also undetermined at this time.

The existing levee to be affected by the proposed improvements is frequently mowed. Predominant vegetation on the levee includes perennial grasses and herbs. Due to human disturbance and vegetative structure, the levee is thought to provide habitat of negligible value to wildlife. In addition, the waters of the Orleans Avenue Canal (which receives stormwater runoff pumped from the Metropolitan New Orleans area) are of generally poor water quality and of negligible value as habitat for fishery resources. Accordingly, the habitat of the levees and adjacent canal to be directly affected by the two alternatives under consideration have been designated as Resource Category 4 habitats, as defined in the Fish and Wildlife Service's Mitigation Policy (Federal Register, Volume 46, No. 15, January 23, 1981).

The indirect impacts of the proposed project may include adverse effects to the nearshore areas of Lake Pontchartrain. The estuarine subtidal open water habitat found in the vicinity of proposed project feature is considered to have medium fish and wildlife resource value and has been designated as Resource Category 3 habitat. The nearshore areas adjacent to the proposed project area provide moderate value nursery and feeding habitat for estuarine-dependent commercial and sport finfishes and shellfishes. Economically important sport and commercial species common to Lake Pontchartrain include brown shrimp, white shrimp, blue crab, Atlantic croaker, gulf menhaden, spot, striped mullet, red drum, southern flounder, spotted seatrout, sand seatrout, black drum, and sheepshead. Wildlife use of the proposed project area includes limited feeding and resting by various seabirds and migratory waterfowl, principally lesser scaup. Lesser scaup feed extensively on benthic fauna of the project area during the winter months.

Although such estuarine areas are relatively abundant on a national basis and within the Louisiana coastal zone, the fish and wildlife habitat quality of such areas has been and continues to be degraded by a variety of human activities and natural phenomena. This degradation is particularly acute in the southern portion of Lake Pontchartrain, which receives chronic inputs of a broad spectrum of contaminants from urban, domestic, and commercial sources. The most significantly impacted habitats are nearshore areas receiving discharges from the major drainage canals (including the Orleans Avenue Outfall Canal) which are the primary receiving basins for stormwater runoff and incidental sewerage effluent from the metropolitan area adjacent to the lake (Schurtz and St. Pé 1984). This stormwater runoff, which is pumped into the Orleans Avenue Outfall Canal and ultimately discharged into Lake Pontchartrain, has been generally characterized as heavily polluted. Typical contaminants present in the canal discharge include oils and other petroleum hydrocarbons, pesticides, fertilizers, heavy metals, salts, combustion hydrocarbons and acids, detergents, organic plasticizers, oxygen demanding wastes, sediment, and raw domestic sewage (Schurtz and St. Pé 1984).

Due to the discharge of the above contaminants, the Louisiana Department of Environmental Quality (1985) has classified the receiving waters of Lake Pontchartrain in the vicinity of the Orleans Parish outfall canals as Water Quality Limited. Such classification indicates that the nearshore waters affected by the canal effluent do not meet water quality standards applicable to the effluent limitations required by the Clean Water Act. In addition, the waters of the outfall canals and the adjacent nearshore areas, although designated by the Louisiana Department of Environmental Quality (1984) for primary and secondary contact recreation and for propagation of fish and wildlife, usually do not satisfy the primary contact designation because of excessive fecal coliform bacteria levels.

There are two basic types of contaminants in the stormwater effluent entering the Orleans Avenue Outfall Canal which affect aquatic life in the canal and nearshore vicinity of the proposed project area. The presence of refractory compounds (i.e., those of relatively low biodegradability), such as organic chemicals and heavy metals, tend to accumulate in the sediments and may demonstrate varying degrees of toxicity, bioaccumulation, and/or sublethal effects to aquatic organisms. Other compounds biodegrade, causing periodic and severe oxygen depletions in the canal and nearshore areas (especially during the warmer months), and also result in eutrophication in the lake overall (Schurtz and St. Pé 1984).

Englande et al. (1979) stated that the mouths of the canals west of the Inner Harbor Navigation Canal (including the Orleans Avenue Outfall Canal) chronically exceed aquatic life standards for fecal coliform, ammonia, and a variety of heavy metals. Furthermore, they indicate that Environmental Protection Agency criteria for propagation of fish and wildlife were consistently exceeded for dissolved oxygen, copper, iron, barium, zinc, cadmium, and phenol. In addition, they identified nickel, mercury, cynanide, arsenic, lead, pH, suspended solids, and oil and grease concentrations as frequently exceeding recommended levels.

The urban runoff entering the outfall canals undergoes quality changes prior to discharge from the drainage canal system. Dissolved oxygen levels decrease and coliform concentrations increase dramatically during canal storage (Englande et al. 1979). Although the effect of contaminated runoff is a year-round problem in the project area, it is most critical during intense rainfall events. Particularly detrimental are oxygen depletions caused by the "first-flush" of stormwater, which is similar in content to domestic sewage due to comingling of effluent from stormwater and leaking sanitary sewers (Englande et al. 1979).

Due to their lack of motility, populations of benthic organisms are severely affected by oxygen depletions and chronic exposure to pollutants in the vicinity of the outfall canals and nearshore areas, resulting in reduction of total numbers and species diversity. Such severe dissolved oxygen depletions cause sudden mass mortalities of aerobic benthic organisms, and if such conditions persist, result in mortality of even highly tolerant, facultatively anaerobic organisms as well (Schurtz and St. Pé 1984). The effects of oxygen depletions and chronic exposure to contaminants in the vicinity of the outfall canals upon demersal and pelagic fishes and crustaceans is more difficult to assess, due to their ability to avoid the affected area.

The principal impacts on fish and wildlife resources associated with dredging and construction activities necessary for installation of the butterfly-valve water control structure would be a temporary increase in turbidity with a corresponding resuspension of contaminated sediment into the water column. Corresponding minor reductions in benthic and plankton populations in the canal can be anticipated along with an unquantified reduction in local populations of those fishes and shellfishes which are dependent upon these food sources. In addition, resuspension of polluted sediments may result in oxygen depletion and the release of toxic materials in the canal and adjacent nearshore areas of Lake Pontchartrain, potentially resulting in a fish kill. Similar impacts would be associated with dredging of borrow material from the Orleans Avenue Canal if such action was needed to upgrade existing pump stations and to enlarge the parallel levees along that canal.

In order to minimize the potential impacts to fish and wildlife resources associated with either proposed alternative, the Service recommends that the following modifications be incorporated in the General Design Memorandum for the Orleans Avenue Outfall feature:

1. A turbidity screen should be used in the outfall canal during all dredging and construction activities which are likely to resuspend sediment, in order to minimize discharges of contaminated suspended sediment into Lake Pontchartrain.

2. All dredged material should be removed by bucket dredge and transported to a state-approved, upland site for disposal.

Please advise us of any significant changes in the proposed project alternatives as the General Design Memorandum proceeds through the Corps' review and approval process so that we may provide you with appropriate findings and recommendations relative to those changes.

Sincerely yours,

David W. Frugé

David W. Frugé
Field Supervisor

cc: EPA, Dallas, TX
LA Dept. of Wildlife and Fisheries, Baton Rouge, LA
LA Dept. of Natural Resources (CMD), Baton Rouge, LA
LA Dept. of Environmental Quality (Attn: Mike Schurtz)
NMFS, Baton Rouge, LA
FWS, Atlanta, GA (AWE)
FWS, Jackson, MS
FWS, Washington, DC (ES/FP)

LITERATURE CITED

Englande, A.J., Jr., Suter, K.P., and N.K. Williams, 1979. Water quality in Orleans Parish: problems, trends, and recommendations. Pages 37-63 In: J.W. Day, Jr., D.D. Culley, Jr., R.E. Turner and A.J. Mumphrey, Jr., eds. Proceedings Third Coastal Marsh and Estuary Management Symposium. Louisiana State University Division of Continuing Education, Baton Rouge, Louisiana.

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Schurtz, M.H. and K.M. St. Pé. 1984. Report on interim findings: water quality investigation of environmental conditions in Lake Pontchartrain. Louisiana Department of Environmental Quality - Water Pollution Control Division, Baton Rouge.

ADDITIONAL REFERENCES

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Rayle, M. F. 1978. Zonation of Lake Pontchartrain invertebrates in a polluted New Orleans outfall canal. M.S. Thesis, University of New Orleans, New Orleans.

LETTER CITY OF NEW ORLEANS DEPT. OF STREETS

APPENDIX A-3

CITY OF NEW ORLEANS
DEPARTMENT OF STREETS
ROOM 6W02 CITY HALL
NEW ORLEANS, LOUISIANA 70112

SIDNEY J. BARTHELEMY
MAYOR

BETTY JO EVERETT
DIRECTOR

August 26, 1986

John Holtgreve
Design Engineering, Inc.
3330 West Esplanade Avenue South
Metairie, Louisiana 70002

Dear Mr. Holtgreve:

The City, Department of Streets wants to insist that provisions be maintained for all bridges to remain open at all times. The fire at Harrison Avenue on Saturday was critical but could have been much worse if access were denied because flood gates prevented access for a five-alarm fire.

Yours very truly,

Betty Jo Everett
DIRECTOR

BJE:dbr

FILE 2001
DISTRIBUTION
WB
JH

September 9, 1986

Ms. Betty Jo Everett, Director
Department of Streets
Room 6W02, City Hall
1300 Perdido Street
New Orleans, Louisiana 70112

Re: Orleans Avenue Canal Flood Protection
Improvement Project
OLB Project No. 2048-0278
DEI Project No. 1006

Dear Ms. Everett:

We fully agree with and appreciate your recommendation concerning the necessity to provide access at all times at all of the bridges crossing the Orleans Canal. Nearly one year ago our firm made exactly the same recommendation to the Board of the Orleans Levee District. The Orleans Levee Board has accepted our recommendation and has authorized design of flood protection methods that will insure that the bridges are not closed during high water events.

We are very pleased that a major city agency such as yours has, by written action, recognized the necessity to maintain the bridges in an open position at all times. Your stated position is very supportive of our original recommendation and will quite frankly provide the U.S. Army Corps of Engineers with needed insight during their review process.

We look forward to a successful completion of this project in the not too distant future, and will continue to advise your office as progress continues on the project.

Thank you for your interest and should you have need of additional information, please call us.

With best regards, I remain

Sincerely,

DESIGN ENGINEERING, INC.

John Holtgreve

John Holtgreve

JH/mnh

cc: Honorable Emile W. Schneider, President
Mr. H. Baylor Lansden, Managing Director
Mr. C. E. Bailey, Chief Engineer
Mr. Ron Elmer, U. S. Army Corps of Engineers

LAKE PONTCHARTRAIN, LOUISIANA AND VICINITY
HIGH LEVEL PLAN
DESIGN MEMORANDUM NO.19, GENERAL DESIGN
ORLEANS AVENUE OUTFALL CANAL

APPENDIX A

A-1 ENVIRONMENTAL ASSESSMENT - FONSI
A-2 U.S. FISH AND WILDLIFE COORDINATION ACT LETTER
A-3 LETTER CITY OF NEW ORLEANS DEPT. OF STREETS

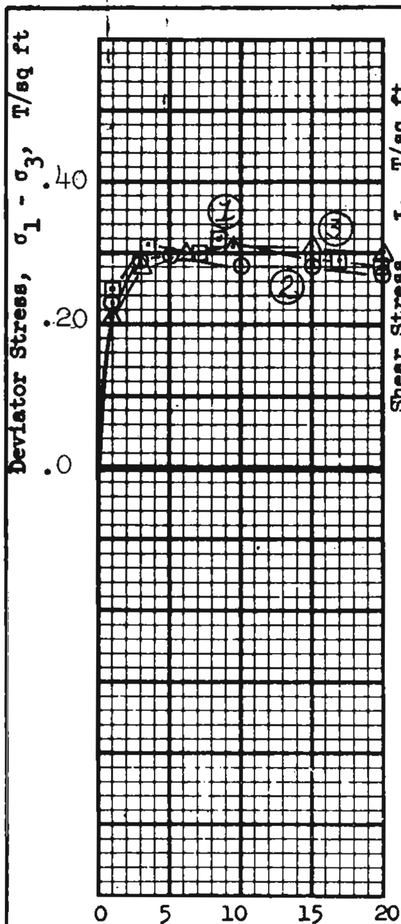
LAKE PONTCHARTRAIN, LOUISIANA AND VICINITY
HIGH LEVEL PLAN
DESIGN MEMORANDUM NO.19, GENERAL DESIGN
ORLEANS AVENUE OUTFALL CANAL

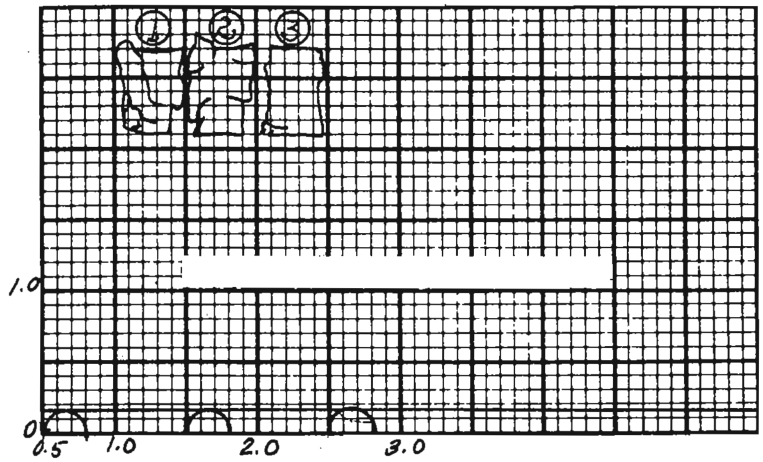
APPENDIX B

B-1 SOIL TEST DATA SHEETS
B-2 AE/COE PIEZOMETER READINGS
B-3 SAMPLE CALCULATIONS

SOIL TEST DATA SHEETS

APPENDIX B-1





sat.γ = 95.5

Test No.			1	2	3	Avg.
Initial	Water content	w_o	80.4 %	87.3 %	81.6%	83.1 %
	Void ratio	e_o	2.19	2.43	2.25	
	Saturation	S_o	100+ %	97.7%	98.6 %	%
	Dry density, lb/cu ft	γ_d	53.4	49.7	52.5	
Before Shear	Water content	w_c	%	%	%	%
	Void ratio	e_c				
	Saturation	S_c	%	%	%	%
	Final back pressure, T/sq ft	u_o				
Final	Water content	w_f	%	%	%	%
	Void ratio	e_f				
Minor principal stress, T/sq ft		σ_3	0.5	1.5	3.0	
Max deviator stress, T/sq ft		$(\sigma_1-\sigma_3)_{max}$	0.32	0.30	0.31	
Time to failure, min		t_f	29	19	50	
Rate of strain, percent/min			0.29	0.26	0.19	
Ult deviator stress, T/sq ft		$(\sigma_1-\sigma_3)_{ult}$				
Initial diameter, in.		D_o	1.40	1.40	1.40	
Initial height, in.		H_o	3.00	3.00	3.00	

Shear Strength Parameters

ϕ = 0 °

tan ϕ = 0

c = 0.16 T/sq ft

Method of saturation ________

☐ Controlled stress

☒ Controlled strain

Type of test Q | Type of specimen UNDISTURBED

Classification PLASTIC CLAY(CH), gray, contains decayed wood fragments and*

LL 116 | PL 37 | PI 79 | | G_s 2.73

Remarks *a small root

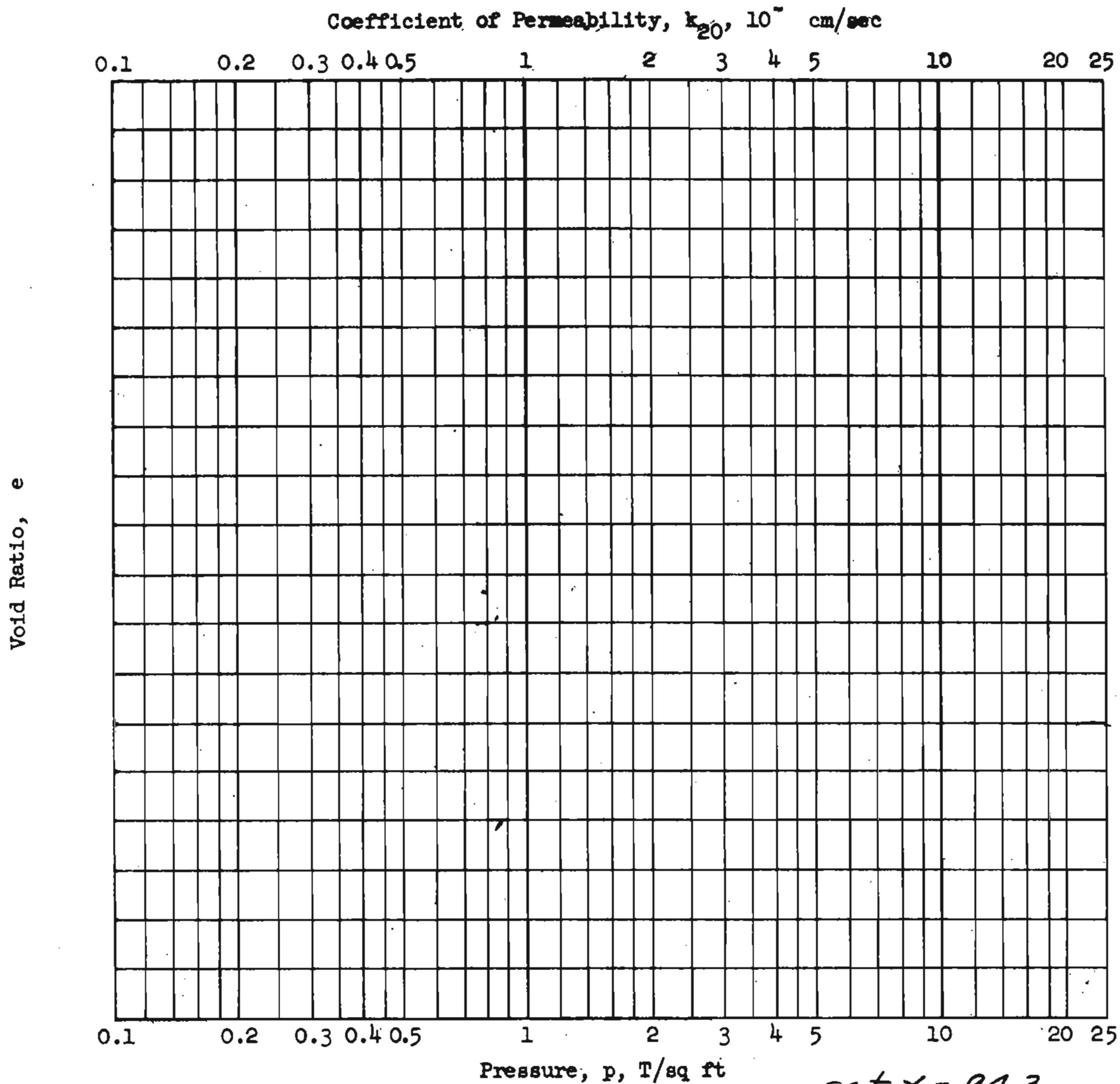
Project LK. PONT., LA. & VIC.-HURR. PROT.1970
ORLEANS PARISH LAKEFRONT LEVEE WEST OF IHNC

Area GDM NO. 2; SUPP. NO.5 (OUTFALL CANALS)

Boring No. 1-OUW | Sample No. 3-C

Depth El -7.7 | Date 19 Nov. 1970

BCH TRIAXIAL COMPRESSION TEST REPORT



sat. γ = 94.3

Type of Specimen UNDISTURBED		Before Test		After Test	
Diam 4.25 in.	Ht 1.168 in.	Water Content, w_o	86.8 %	w_f	%
Overburden Pressure, p_o T/sq ft		Void Ratio, e_o	2.40	e_f	
Preconsol. Pressure, p_c 0.52 T/sq ft		Saturation, S_o	98.9 %	S_f	%
Compression Index, C_c 0.87		Dry Density, γ_d	50.2 lb/ft^3		
Classification PLASTIC CLAY (CH)*		k_{20} at e_o = × 10^{-} cm/sec			

LL -	G_s 2.73 From Q
PL -	D_{10}

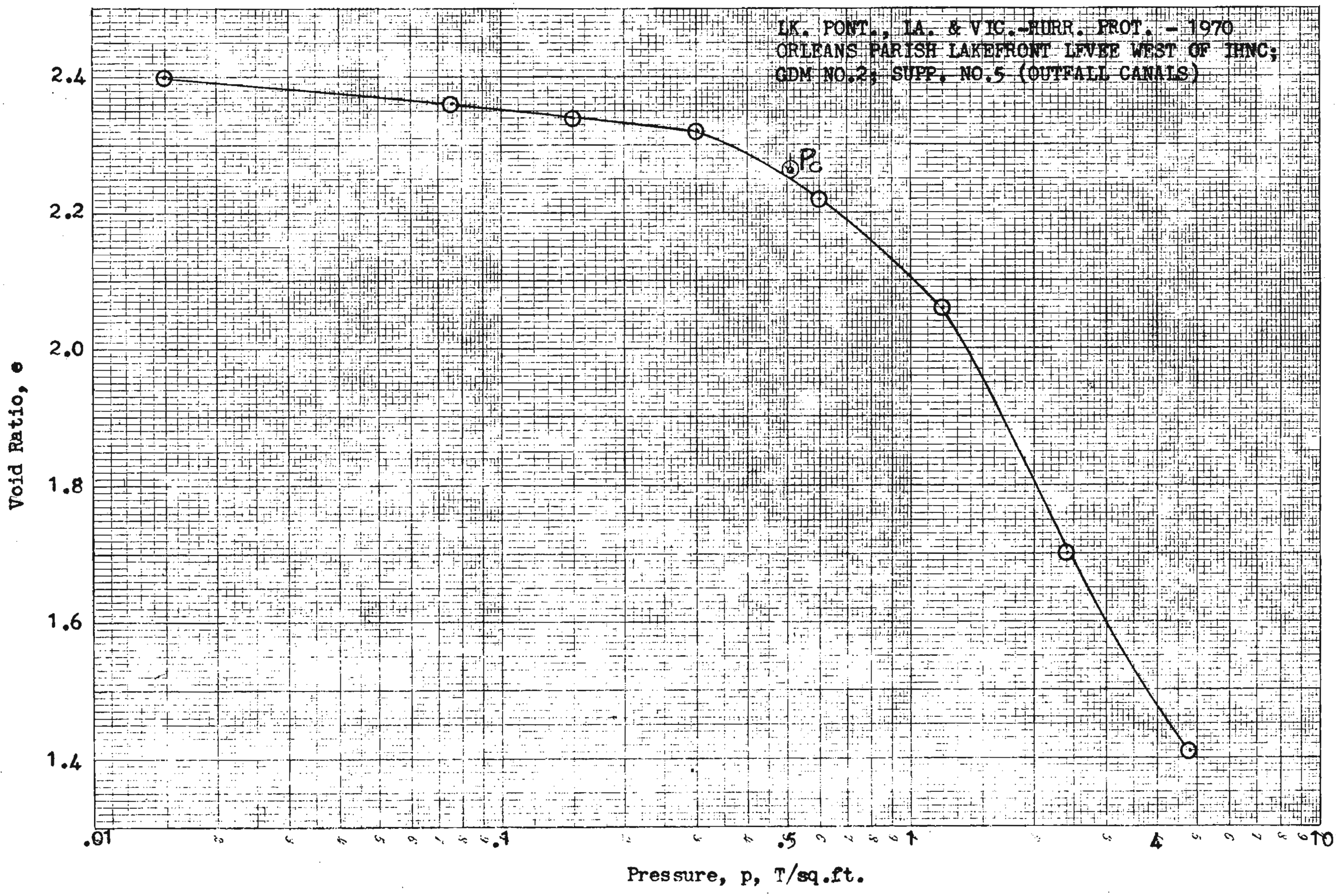
Remarks *bluish gray

See attached plot for Pressure vs Void Ratio Curve

Project LK. PONT., LA. & VIC.-HURR. PROT.-1970, ORLEANS PARISH LAKEFRONT LEVEE WEST	
Area OF IHNC; GDM #2; SUPP. #5(OUTFALL CANALS)	
Boring No. 1-OUW	Sample No. 3-C
~~Depth~~ El -7.7	Date 2 December, 1970

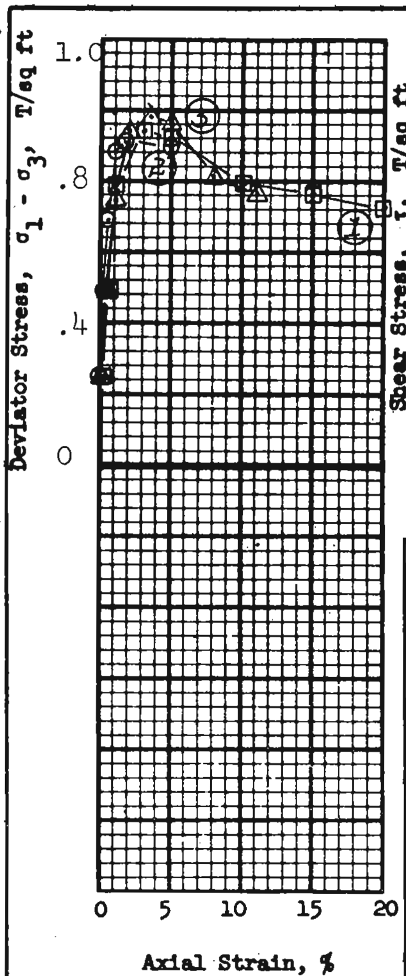
JB **CONSOLIDATION TEST REPORT**

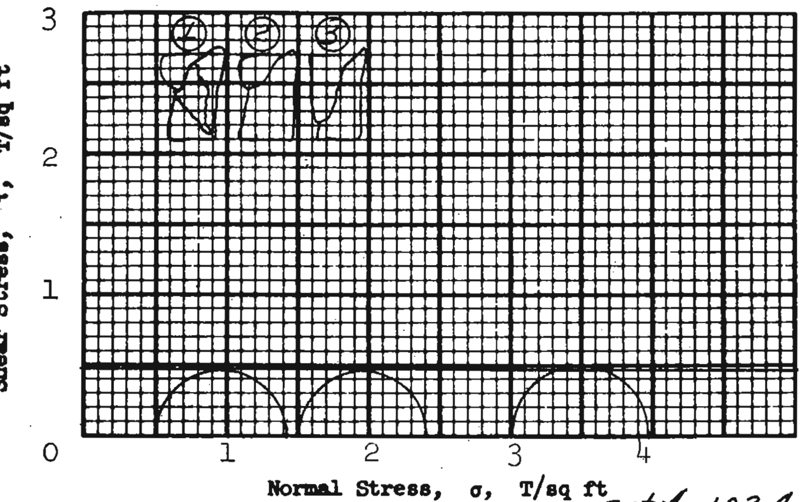
NO. 3115. 20 DIVISIONS PER INCH (120 DIVISIONS) BY 3 5-INCH CYCLES RATIO RULING   CODEX BOOK COMPANY, INC.   NORWOOD, MASSACHUSETTS



3

USAEWES SOILS TEST SECTION





sat γ = 103.4

Test No.			1	2	3	Avg.
Initial	Water content	w_o	57.2 %	55.9 %	58.1 %	57.1 %
	Void ratio	e_o	1.50	1.46	1.52	
	Saturation	S_o	100+ %	100+ %	99.9 %	%
	Dry density, lb/cu ft	γ_d	65.8	66.8	64.9	
Before Shear	Water content	w_c	%	%	%	%
	Void ratio	e_c				
	Saturation	S_c	%	%	%	%
	Final back pressure, T/sq ft	u_o				
Final	Water content	w_f	%	%	%	%
	Void ratio	e_f				
Minor principal stress, T/sq ft		σ_3	0.5	1.5	3.0	
Max deviator stress, T/sq ft		$(\sigma_1-\sigma_3)_{max}$	0.94	0.91	0.98	
Time to failure, min		t_f	14	13	45	
Rate of strain, percent/min			0.22	0.14	0.08	
Ult deviator stress, T/sq ft		$(\sigma_1-\sigma_3)_{ult}$				
Initial diameter, in.		D_o	1.41	1.41	1.41	
Initial height, in.		H_o	3.00	3.00	3.00	

Shear Strength Parameters

ϕ = 0 °

tan ϕ = 0

c = 0.47 T/sq ft

Method of saturation ______

☐ Controlled stress

☒ Controlled strain

Type of test Q	Type of specimen UNDISTURBED
Classification	PLASTIC CLAY(CH), gray and brown, contains a few wood fragments

LL	PL	PI		G_s
126	34	92		2.63

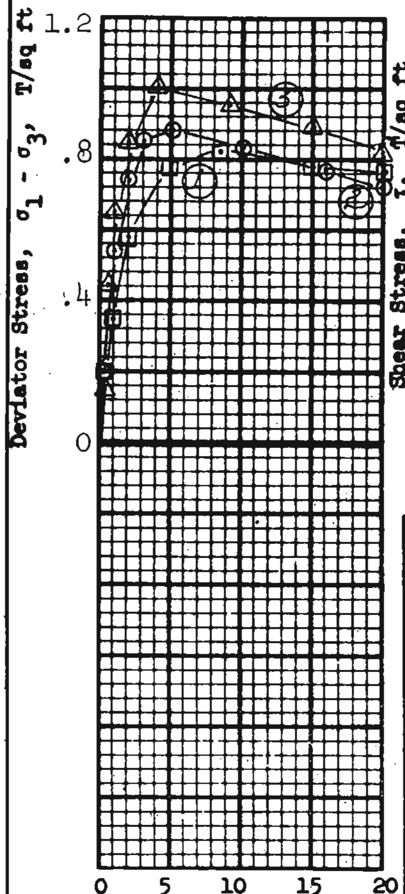
Remarks ______

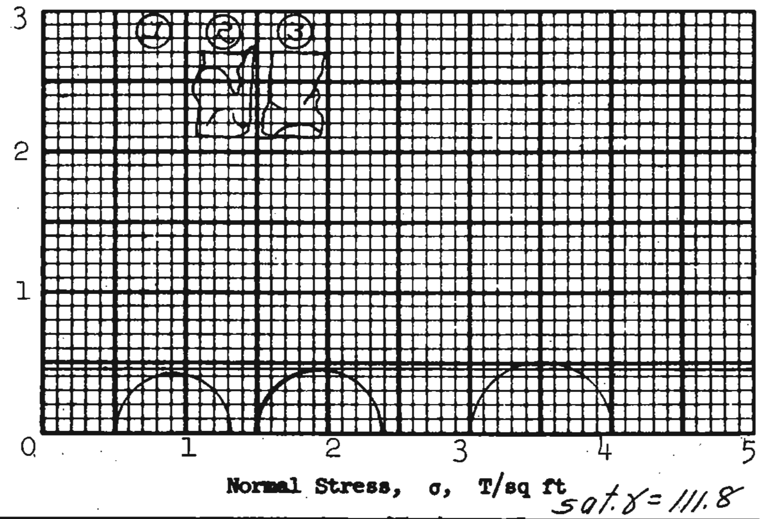
Project LK. PONT. LA.&VIC.-HURR. PROT.(70)
ORLEANS PARISH LAKE FRONT LEVEE WEST OF IHNC

Area GDM NO. 2, SUPP. NO.5(OUTFALL CANALS)

Boring No. 2-OUE	Sample No. 2-B
Depth El -4.9	Date 4 Dec. 1970

JMS **TRIAXIAL COMPRESSION TEST REPORT**





sat. γ = 111.8

Test No.			1	2	3	Avg.
Initial	Water content	w_o	38.2 %	40.3 %	41.7 %	40.1 %
	Void ratio	e_o	1.07	1.13	1.14	
	Saturation	S_o	95.3 %	95.2 %	97.7 %	%
	Dry density, lb/cu ft	γ_d	80.6	78.3	77.8	
Before Shear	Water content	w_c	%	%	%	%
	Void ratio	e_c				
	Saturation	S_c	%	%	%	%
	Final back pressure, T/sq ft	u_o				
Final	Water content	w_f	%	%	%	%
	Void ratio	e_f				
Minor principal stress, T/sq ft		σ_3	0.5	1.5	3.0	
Max deviator stress, T/sq ft		$(\sigma_1-\sigma_3)_{max}$	0.82	0.88	1.00	
Time to failure, min		t_f	71	33	20	
Rate of strain, percent/min			0.12	0.15	0.20	
Ult deviator stress, T/sq ft		$(\sigma_1-\sigma_3)_{ult}$				
Initial diameter, in.		D_o	1.40	1.41	1.41	
Initial height, in.		H_o	3.00	3.00	3.00	

Shear Strength Parameters

ϕ = 0 °

tan ϕ = 0

c = 0.45 T/sq ft

Method of saturation ________

- [ ] Controlled stress
- [x] Controlled strain

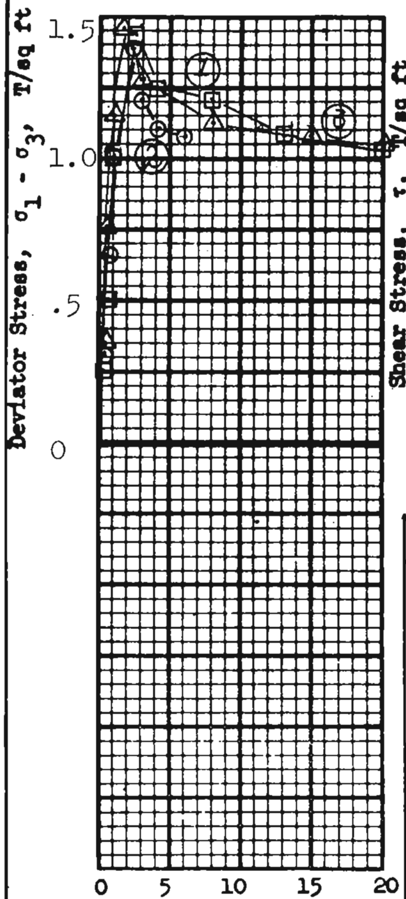
Type of test Q	Type of specimen UNDISTURBED		
Classification SANDY CLAY(CL),gray, contains pockets of sand			
LL 41	PL 19	PI 22	G_s 2.67

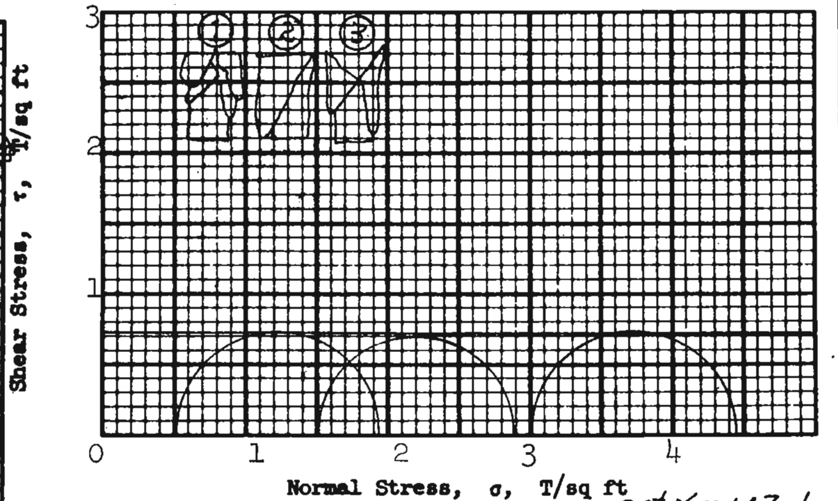
Remarks ________

Project LK. PONT. LA.,&VIC.-HURR. PROT. (70)	
ORLEANS PARISH LAKEFRONT LEVEE WEST OF IHNC;	
Area GDM NO.2, SUPP. NO.5 (OUTFALL CANALS)	
Boring No. 2-OUE	Sample No. 14-C
~~Depth~~ El -54.4	Date 7 Dec. 1970
BCH	TRIAXIAL COMPRESSION TEST REPORT

ENG FORM 1 JUN 65 2089 *(EM 1110-2-1902)* PREVIOUS EDITIONS ARE OBSOLETE

5, *TRANSLUCENT*





sat. γ = 107.1

Test No.			1	2	3	Avg.
Initial	Water content	w_o	51.2 %	52.1 %	49.6 %	51.0 %
	Void ratio	e_o	1.40	1.42	1.36	
	Saturation	S_o	99.1 %	99.4 %	98.8 %	%
	Dry density, lb/cu ft	γ_d	70.4	70.0	71.8	
Before Shear	Water content	w_c	%	%	%	%
	Void ratio	e_c				
	Saturation	S_c	%	%	%	%
	Final back pressure, T/sq ft	u_o				
Final	Water content	w_f	%	%	%	%
	Void ratio	e_f				
Minor principal stress, T/sq ft		σ_3	0.5	1.5	3.0	
Max deviator stress, T/sq ft		$(\sigma_1-\sigma_3)_{max}$	1.44	1.39	1.46	
Time to failure, min		t_f	15	22	16	
Rate of strain, percent/min			0.15	0.10	0.11	
Ult deviator stress, T/sq ft		$(\sigma_1-\sigma_3)_{ult}$				
Initial diameter, in.		D_o	1.40	1.40	1.40	
Initial height, in.		H_o	3.00	3.00	3.00	

Shear Strength Parameters

ϕ = 0 °

tan ϕ = 0

c = 0.72 T/sq ft

Method of saturation ________

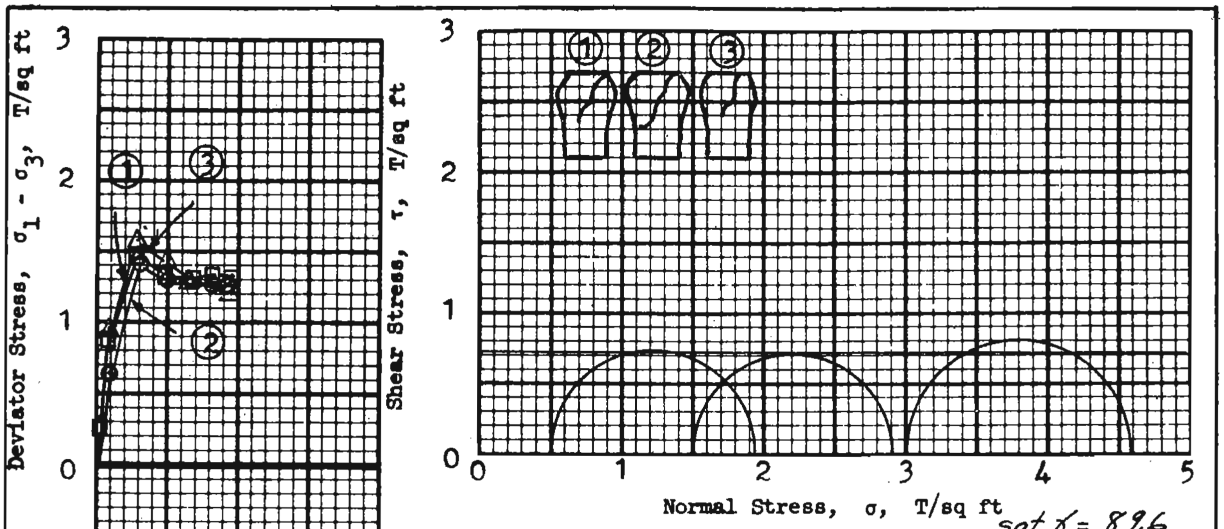
☐ Controlled stress

☒ Controlled strain

Type of test Q	Type of specimen UNDISTURBED				
Classification PLASTIC CLAY(CH), gray, contains a few 1/16" to 1/8" dia. shells					
LL 75	PL 24	PI 51		G_s 2.71	

Remarks ________

Project LK. PONT. LA.&VIC.-HURR. PROT. (70)	
ORLEANS PARISH LAKEFRONT LEVEE WEST OF IHNC,	
Area GDM NO 2, SUPP NO. 5 (OUTFALL CANALS)	
Boring No. 2-OUE	Sample No. 17-C
~~Depth~~ El -66.3	Date 7 Dec. 1970
JMS	TRIAXIAL COMPRESSION TEST REPORT



sat. γ = 89.6

Test No.			1	2	3	Avg.
Initial	Water content	w_o	92.9 %	87.4 %	95.3 %	91.9 %
	Void ratio	e_o	2.24	2.08	2.31	
	Saturation	S_o	99.1 %	100+ %	98.6 %	%
	Dry density, lb/cu ft	γ_d	46.0	48.5	45.1	
Before Shear	Water content	w_c	%	%	%	%
	Void ratio	e_c				
	Saturation	S_c	%	%	%	%
	Final back pressure, T/sq ft	u_o				
Final	Water content	w_f	%	%	%	%
	Void ratio	e_f				
Minor principal stress, T/sq ft		σ_3	0.5	1.5	3.0	
Max deviator stress, T/sq ft		$(\sigma_1-\sigma_3)_{max}$	1.45	1.40	1.58	
Time to failure, min		t_f	31	31	31	
Rate of strain, percent/min			0.09	0.09	0.09	
Ult deviator stress, T/sq ft		$(\sigma_1-\sigma_3)_{ult}$				
Initial diameter, in.		D_o	1.40	1.40	1.40	
Initial height, in.		H_o	3.00	3.00	3.00	

Shear Strength Parameters

ϕ = 0 °

tan ϕ = 0

c = 0.72 T/sq ft

Method of saturation ______

☐ Controlled stress

☒ Controlled strain

Type of test Q | Type of specimen UNDISTURBED

Classification PLASTIC CLAY(CH), dark gray, contains large amounts of organic*

LL 136 | PL 46 | PI 90 | | G_s 2.29

Remarks *matter

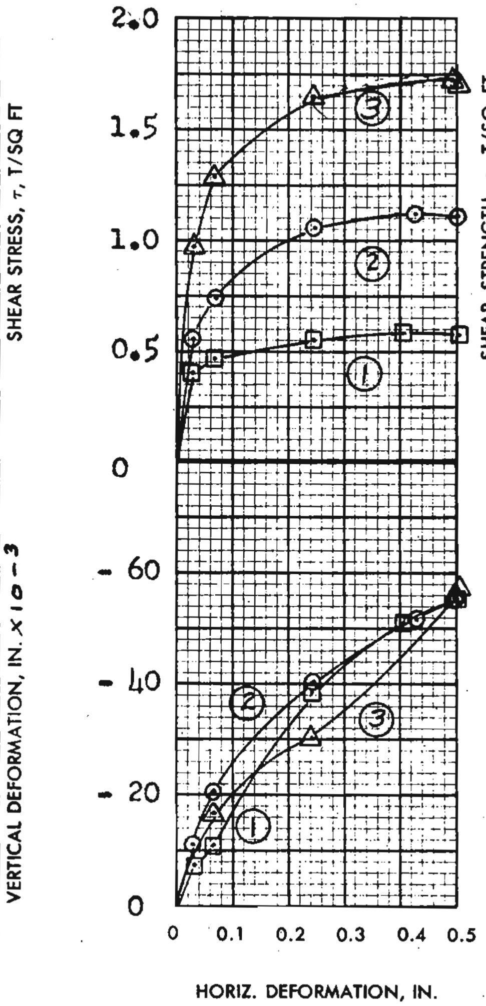
Project LK. PONT., LA., & VIC.-HURR. PROT. (70)
ORLEANS PARISH LAKEFRONT LEVEE WEST OF IHNC

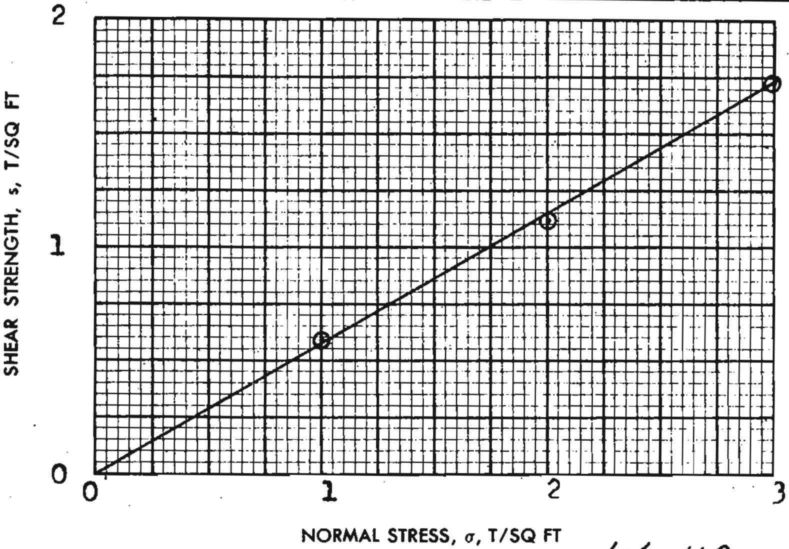
Area GDM #2, SUPP. #5, (OUTFALL CANALS)

Boring No. 2-OUE | Sample No. 19-D

El -75.1 | Date 7 Dec., 1970

TES TRIAXIAL COMPRESSION TEST REPORT





sat. γ = 110

TEST NO.			1	2	3	Avg.
INITIAL	WATER CONTENT	w_o	44.9 %	55.6 %	40.2 %	46.9 %
	VOID RATIO	e_o	1.20	1.38	1.13	
	SATURATION	S_o	99.9 %	100+ %	95.0 %	%
	DRY DENSITY, LB/CU FT	γ_d	75.6	70.1	78.3	
VOID RATIO AFTER CONSOLIDATION		e_c				
TIME FOR 50 PERCENT CONSOLIDATION, MIN		t_{50}	2	3	< 1	
FINAL	WATER CONTENT	w_f	50.5 %	34.9 %	33.5 %	%
	VOID RATIO	e_f				
	SATURATION	S_f	%	%	%	%
NORMAL STRESS, T/SQ FT		σ	1.0	2.0	3.0	
MAXIMUM SHEAR STRESS, T/SQ FT		τ_{max}	0.58	1.12	1.73	
ACTUAL TIME TO FAILURE, MIN		t_f	2190	2310	2700	
RATE OF STRAIN, IN./MIN			.00018	.00018	.00018	
ULTIMATE SHEAR STRESS, T/SQ FT		τ_{ult}				

SHEAR STRENGTH PARAMETERS

ϕ' = 30°

TAN ϕ' = 0.576

c' = 0 T/SQ FT

☐ CONTROLLED STRESS

☒ CONTROLLED STRAIN

TYPE OF SPECIMEN	UNDISTURBED	3.00 IN. SQUARE	0.625 IN. THICK
CLASSIFICATION	LEAN CLAY(CL),gray, contains sand strata		
LL 39	PL 16	PI 23	G_s 2.67

REMARKS

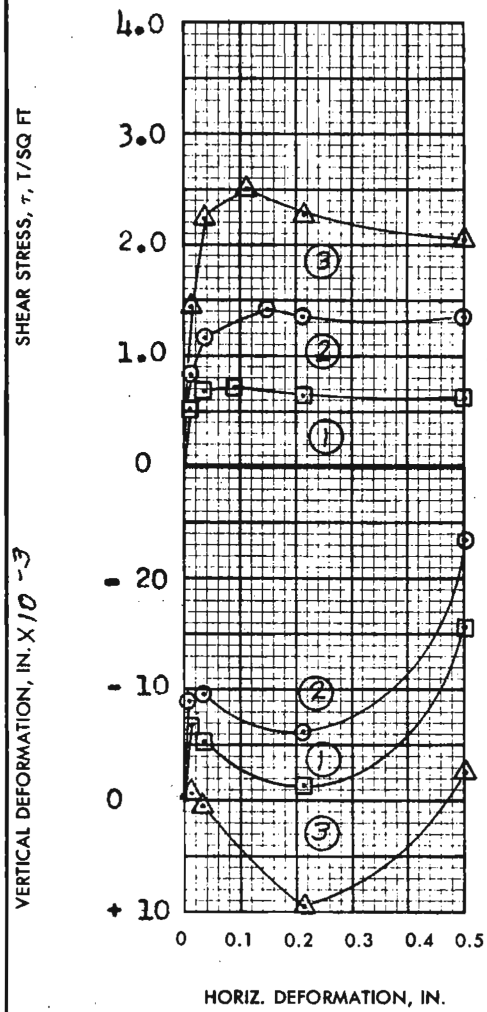
PROJECT LK.PONT.LA.,& VIC. - HURR. PROT.(70)

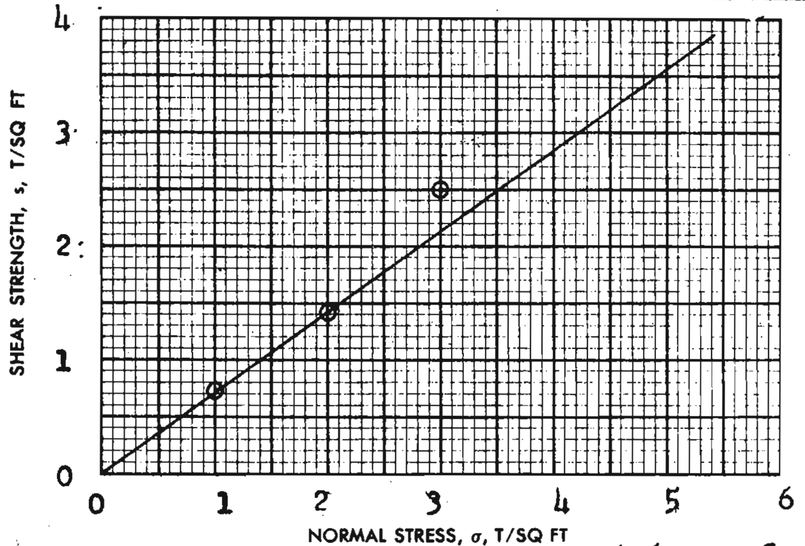
ORLEANS PARISH LAKE FRONT LEVEE, WEST OF

AREA IHNC; G.D.M. # 2, SUPP. # 5(OUTFALL CANALS)

BORING NO.	2-OUE	SAMPLE NO.	11 - B
~~DEPTH~~ EL	- 40.9	DATE	15 Dec. 1970

BWG DIRECT SHEAR TEST REPORT USAEWES SOILS TEST SECTION





sat. γ = 123.9

SHEAR STRENGTH PARAMETERS

ϕ' = 35°

TAN ϕ' = 0.705

c' = 0 T/SQ FT

☐ CONTROLLED STRESS

☒ CONTROLLED STRAIN

TEST NO.			1	2	3	Avg.
INITIAL	WATER CONTENT	w_o	23.3 %	23.3 %	23.4 %	23.3 %
	VOID RATIO	e_o	0.693	0.677	0.684	
	SATURATION	S_o	89.4 %	91.5 %	91.0 %	%
	DRY DENSITY, LB/CU FT	γ_d	98.1	99.0	98.6	
VOID RATIO AFTER CONSOLIDATION		e_c				
TIME FOR 50 PERCENT CONSOLIDATION, MIN		t_{50}				
FINAL	WATER CONTENT	w_f	25.6 %	25.6 %	24.3 %	%
	VOID RATIO	e_f				
	SATURATION	S_f	%	%	%	%
NORMAL STRESS, T/SQ FT		σ	1.0	2.0	3.0	
MAXIMUM SHEAR STRESS, T/SQ FT		τ_{max}	0.72	1.41	2.50	
ACTUAL TIME TO FAILURE, MIN		t_f	600	900	690	
RATE OF STRAIN, IN./MIN			.00018	.00018	.00018	
ULTIMATE SHEAR STRESS, T/SQ FT		τ_{ult}				

TYPE OF SPECIMEN UNDISTURBED 3.00 IN. SQUARE 0.550 IN. THICK

CLASSIFICATION SAND(SP), light gray, contains shell fragments 1/4" in diameter

LL NP | PL NP | PI NP | G_s 2.66

REMARKS

PROJECT LK. PONT. LA., & VIC. - HURR. PROT (70)

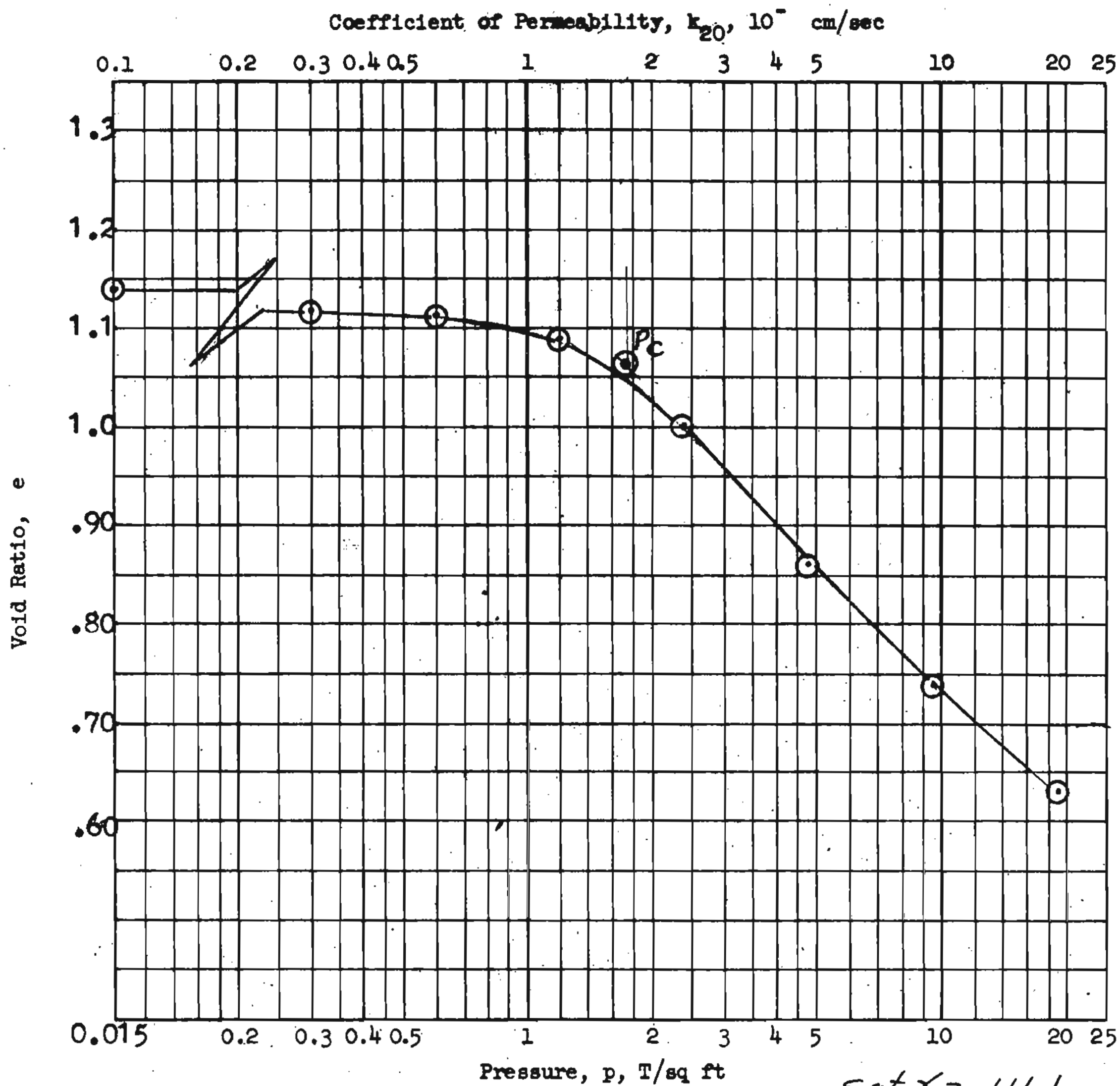
ORLEANS PARISH LAKE FRONT LEVEE, WEST OF IHNC;

AREA G.D.M. # 2, SUPP. # 5 (OUTFALL CANALS)

BORING NO. 2-OUE | SAMPLE NO. 13-B

~~DEPTH~~ EL - 47.5 | DATE 10 Dec. 1970

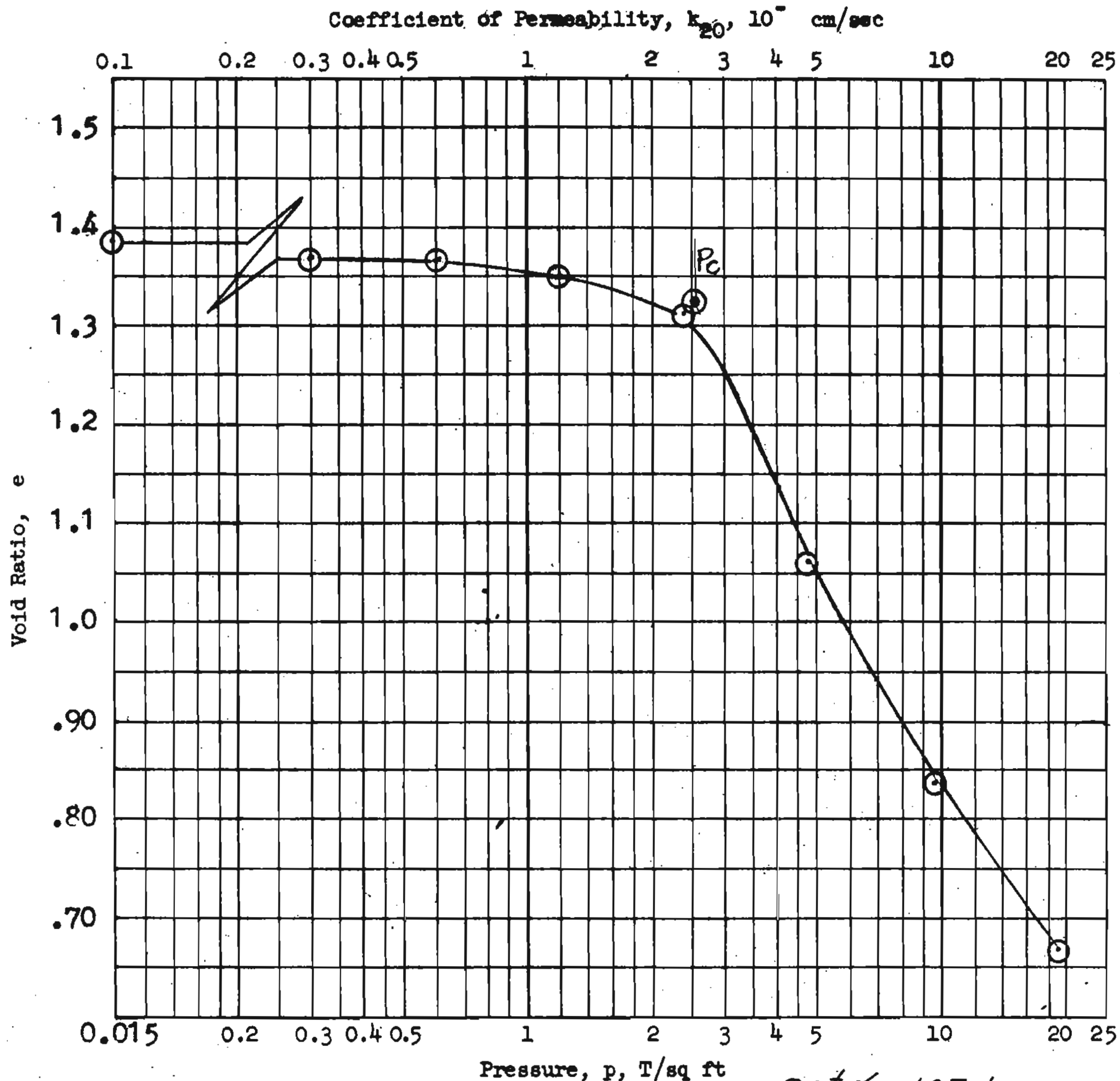
BWG **DIRECT SHEAR TEST REPORT**



sat. γ = 111.1

Type of Specimen UNDISTURBED		Before Test			After Test	
Diam 4.25 in.	Ht 1.158 in.	Water Content, w_o	42.6 %		w_f	%
Overburden Pressure, p_o T/sq ft		Void Ratio, e_o	1.14		e_f	
Preconsol. Pressure, p_c 1.70 T/sq ft		Saturation, S_o	99.5 %		S_f	%
Compression Index, C_c 0.46		Dry Density, γ_d	77.8 lb/ft^3			
Classification SANDY CLAY (CL), *		k_{20} at e_o =	× 10^{-} cm/sec			
LL -	G_s 2.67 From Q	Project LK. PONT., LA. & VIC.-HURR. PROT.(70)				
PL -	D_{10}	ORLEANS PARISH LAKEFRONT LEVEE, WEST OF IHNC;				
Remarks * gray, contains pockets		Area GDM #2; SUPP. #5 (OUTFALL CANALS)				
of sand		Boring No. 2-OUE		Sample No. 14-C		
		~~Depth~~ El -54.4		Date 5 January, 1971		
		JDB CONSOLIDATION TEST REPORT				

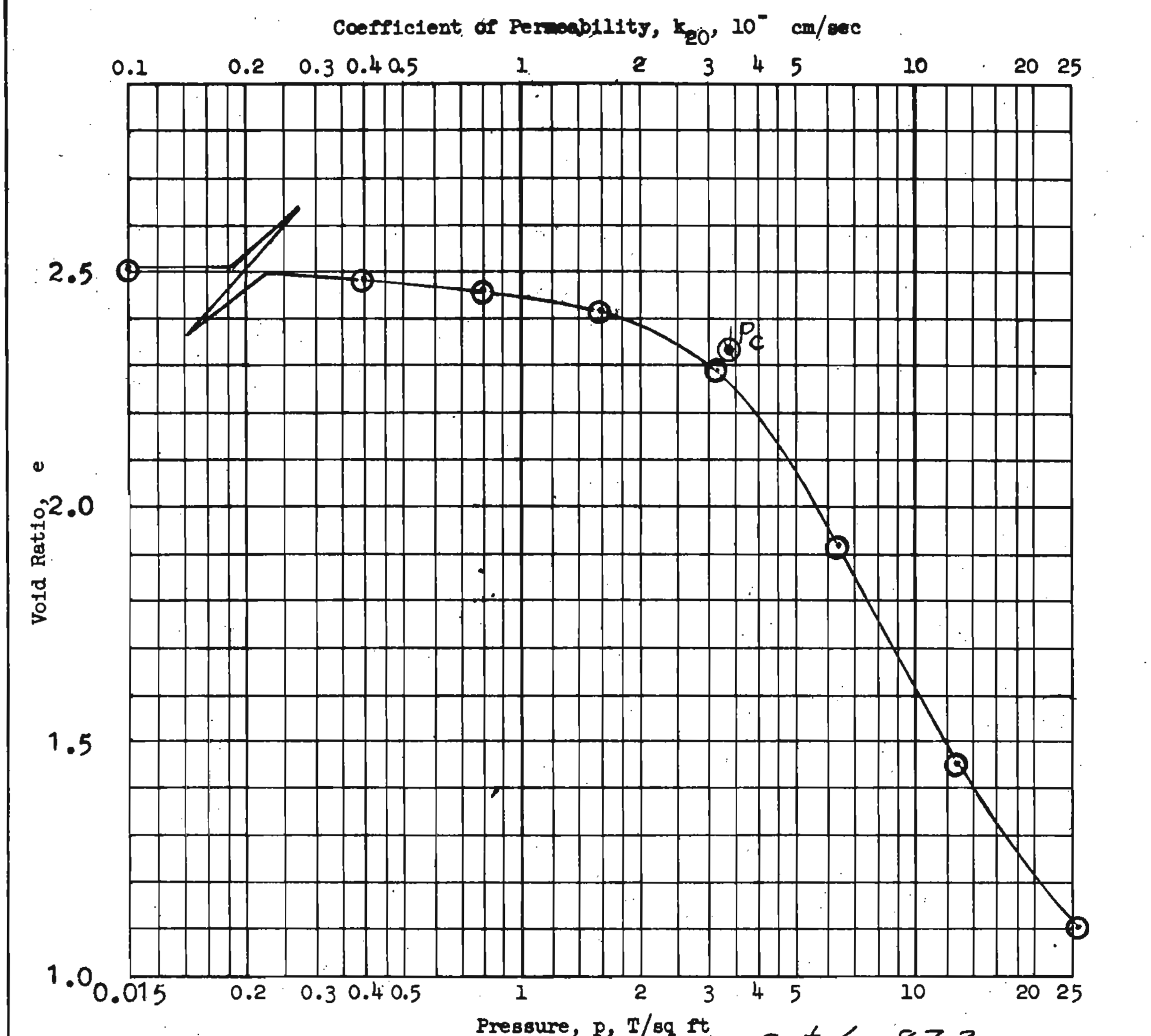
ENG FORM 1 MAY 63 2090 PREVIOUS EDITIONS ARE OBSOLETE. *(TRANSLUCENT)* 0 3424



sat. γ = 107.1

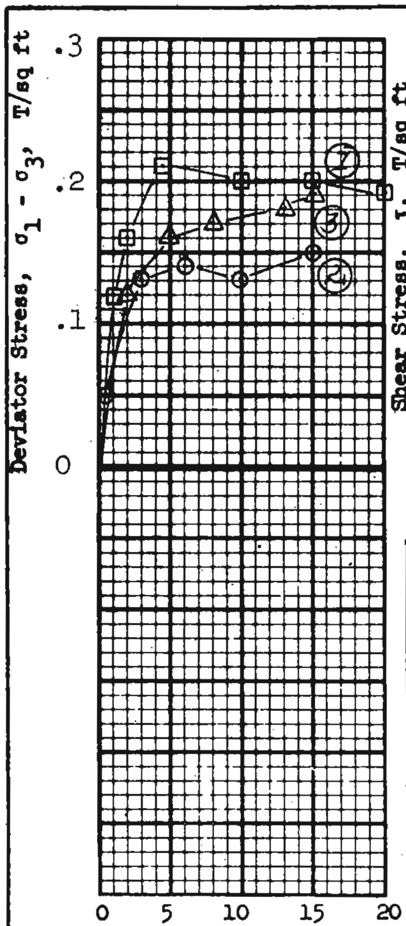
Type of Specimen UNDISTURBED		Before Test		After Test	
Diam 4.25 in.	Ht 1.163 in.	Water Content, w_o	50.5 %	w_f	%
Overburden Pressure, p_o T/sq ft		Void Ratio, e_o	1.39	e_f	
Preconsol. Pressure, p_c 2.52 T/sq ft		Saturation, S_o	98.2 %	S_f	%
Compression Index, C_c 0.91		Dry Density, γ_d	70.7 lb/ft^3		
Classification PLASTIC CLAY(CH),*		k_{20} at e_o = × 10^{-} cm/sec			
LL –	G_s 2.71 From Q	Project LK. PONT.,LA. & VIC.-HURR. PROT.(70)			
PL –	D_{10}	ORLEANS PARISH LAKEFRONT LEVEE, WEST OF IHNC;			
* Remarks gray, contains a few		Area GDM #2; SUPP. #5; (OUTFALL CANALS)			
1/16" to 1/8" dia. shells		Boring No. 2-OUE		Sample No. 17-C	
		~~Depth~~ El -66.3		Date 5 January, 1971	
		JDB CONSOLIDATION TEST REPORT			

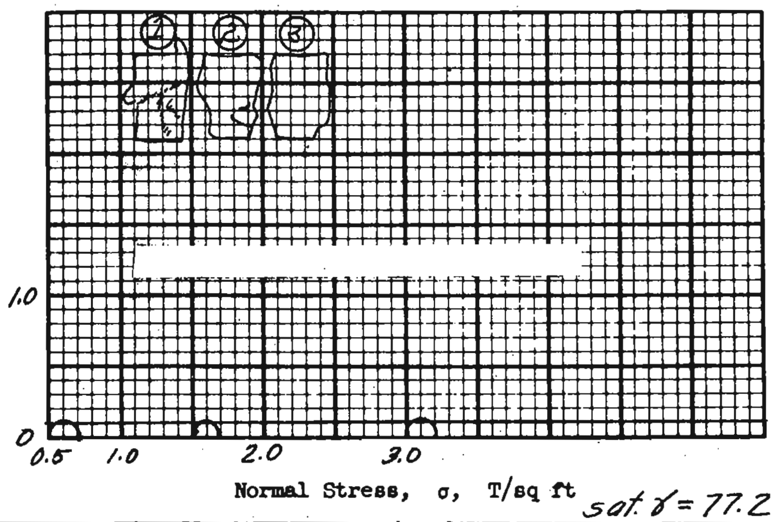
ENG FORM 1 MAY 63 2090 PREVIOUS EDITIONS ARE OBSOLETE. (TRANSLUCENT) 0 3424



sat. γ = 87.2

Type of Specimen UNDISTURBED		Before Test	After Test
Diam 4.25 in.	Ht 1.170 in.	Water Content, w_o 104.3 %	w_f %
Overburden Pressure, p_o T/sq ft		Void Ratio, e_o 2.51	e_f
Preconsol. Pressure, p_c 3.40 T/sq ft		Saturation, S_o 99.1 %	S_f %
Compression Index, C_c 1.52		Dry Density, γ_d 42.5 lb/ft^3	
Classification PLASTIC CLAY(CH) *		k_{20} at e_o = × 10^{-} cm/sec	
LL -	G_s 2.39 From Q	Project LK. PONT., LA. & VIC.-HURR. PROT.(70)	
PL -	D_{10}	ORLEANS PARISH LAKEFRONT LEVEE, WEST OF IHNC	
*Remarks dark gray, contains a		Area GDM #2; SUPP. #5; (OUTFALL CANALS)	
large amount of organic matter		Boring No. 2-OUE	Sample No. 19-D
		~~Depth~~ El -75.1	Date 3 Feb., 1971
		JDB CONSOLIDATION TEST REPORT	





sat. γ = 77.2

Shear Strength Parameters

ϕ = 0 °

tan ϕ = 0

c = 0.10 T/sq ft

Method of saturation ________

☐ Controlled stress

☒ Controlled strain

Test No.			1	2	3	Avg.
Initial	Water content	w_o	168.4%	197.7	188.2%	184.8%
	Void ratio	e_o	3.70	4.41	4.18	
	Saturation	S_o	100+ %	98.6 %	99.1 %	%
	Dry density, lb/cu ft	γ_d	29.2	25.4	26.5	
Before Shear	Water content	w_c	%	%	%	%
	Void ratio	e_c				
	Saturation	S_c	%	%	%	%
	Final back pressure, T/sq ft	u_o				
Final	Water content	w_f	%	%	%	%
	Void ratio	e_f				
Minor principal stress, T/sq ft		σ_3	0.5	1.5	3.0	
Max deviator stress, T/sq ft		$(\sigma_1-\sigma_3)_{max}$	0.21	0.15	0.19	
Time to failure, min		t_f	17	65	50	
Rate of strain, percent/min			0.27	0.23	0.30	
Ult deviator stress, T/sq ft		$(\sigma_1-\sigma_3)_{ult}$				
Initial diameter, in.		D_o	1.40	1.39	1.39	
Initial height, in.		H_o	3.00	3.00	3.00	

Type of test Q	Type of specimen UNDISTURBED		
Classification PLASTIC CLAY(CH),dark brown, contains wood fragments and*			
LL 208	PL 51	PI 157	G_s 2.20

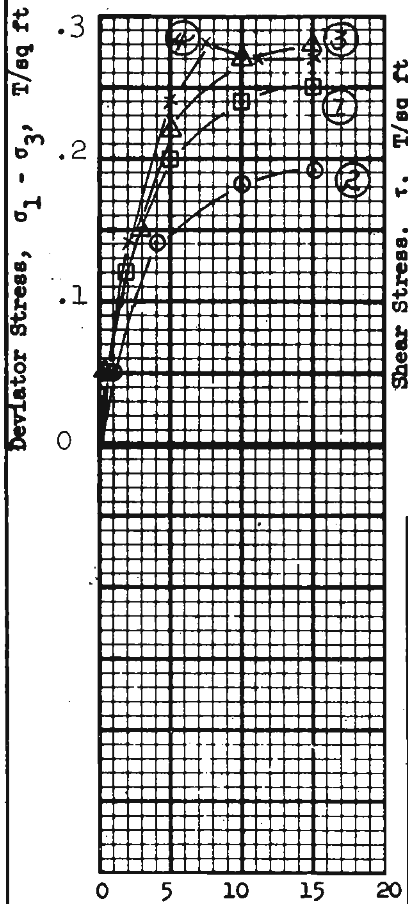
Remarks *roots, highly organic

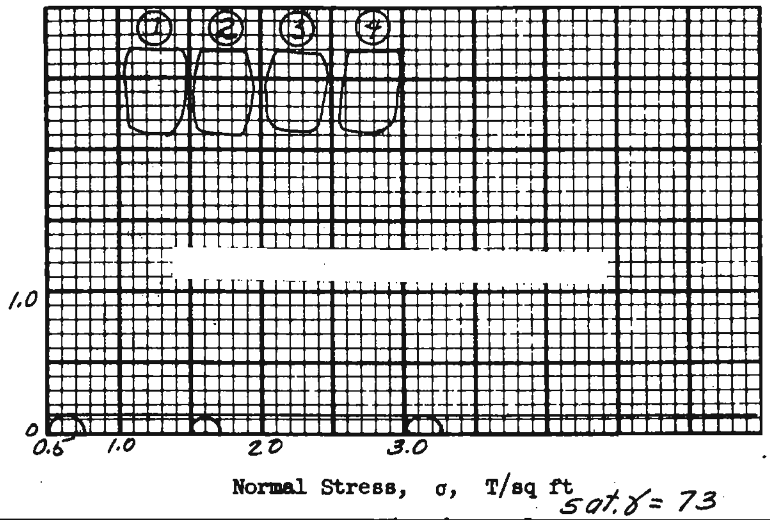
Project LK.PONT. LA.& VIC.-HURR. PROT.(70)	
ORLEANS PARISH LAKEFRONT LEVEE WEST OF INHC	
Area GDM NO.2;SUPP NO. 5 (OUTFALL CANALS)	
Boring No. 3-OUW	Sample No. 4-A
~~Depth~~ El -4.5	Date 24 Nov. 1970
BCH	TRIAXIAL COMPRESSION TEST REPORT

ENG FORM 1 JUN 65 2089 (EM 1110-2-1902) PREVIOUS EDITIONS ARE OBSOLETE

 TRANSLUCENT

USAEWES SOILS TEST SECTION





sat.γ = 73

Test No.			1	2	3	4	Avg.
Initial	Water content	w_o	223.8 %	287.1%	228.4%	309.7%	262.3
	Void ratio	e_o	4.80	6.15	4.99	6.74	
	Saturation	S_o	98.8 %	99.5 %	97.0 %	97.4 %	
	Dry density, lb/cu ft	γ_d	22.8	18.5	22.1	17.1	
Before Shear	Water content	w_c	%	%	%	%	
	Void ratio	e_c					
	Saturation	S_c	%	%	%	%	
	Final back pressure, T/sq ft	u_o					
Final	Water content	w_f	%	%	%	%	
	Void ratio	e_f					
Minor principal stress, T/sq ft		σ_3	0.5	1.5	3.0	3.0	
Max deviator stress, T/sq ft		$(\sigma_1-\sigma_3)_{max}$	0.25	0.19	0.28	0.27	
Time to failure, min		t_f	71	88	72	48	
Rate of strain, percent/min			0.21	0.17	0.21	0.31	
Ult deviator stress, T/sq ft		$(\sigma_1-\sigma_3)_{ult}$					
Initial diameter, in.		D_o	1.42	1.41	1.41	1.39	
Initial height, in.		H_o	3.00	3.00	3.00	3.00	

Shear Strength Parameters

ϕ = 0 °

tan ϕ = 0

c = 0.13 T/sq ft

Method of saturation ________

☐ Controlled stress

☒ Controlled strain

Type of test Q | Type of specimen UNDISTURBED

Classification ORGANIC CLAY(OH),dark gray, contains numerous 1/8" to 3/4" dia.*

LL 219 | PL 88 | PI 131 | G_s 2.12

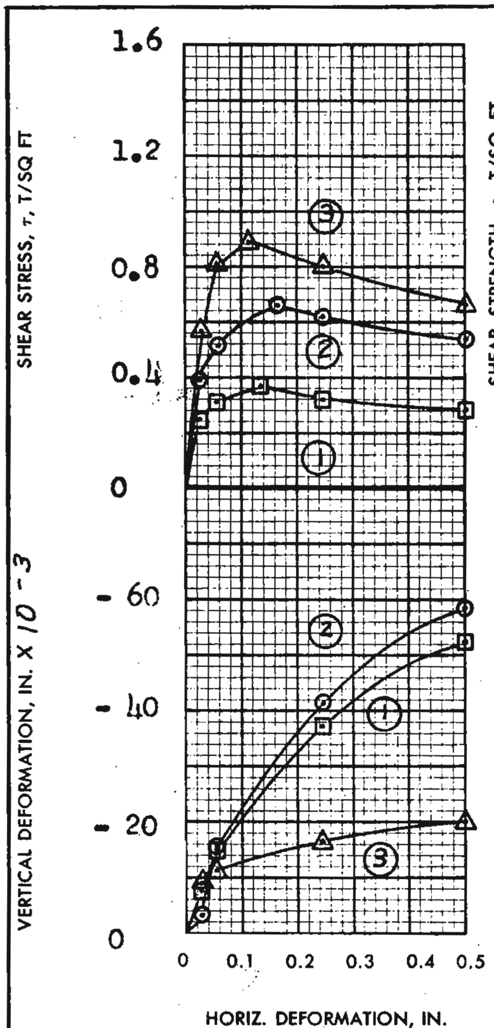
Remarks *roots
Specimens patched where
roots removed

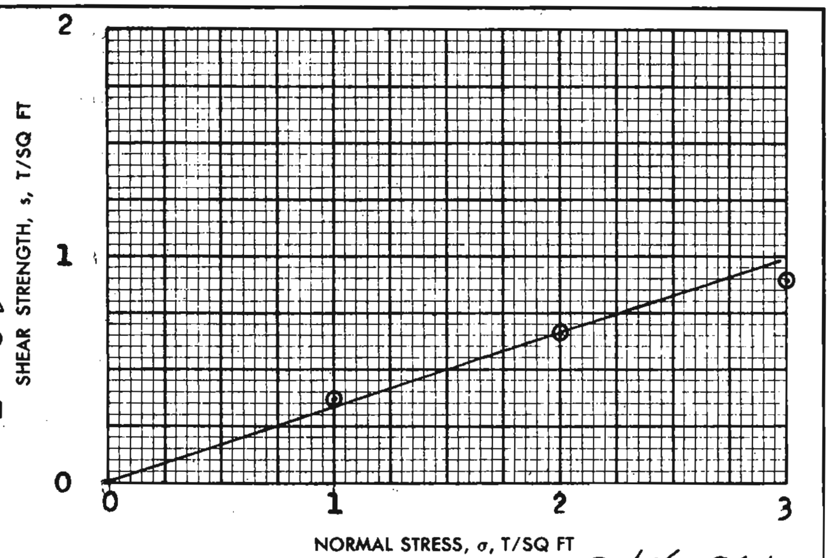
Project LK. PONT. LA. & VIC.-HURR. PROT.(70)
ORLEANS PARISH LAKEFRONT LEVEE WEST OF IHNC,
Area GDM NO 2;SUPP NO. 5 (OUTFALL CANALS)

Boring No. 3-OUW | Sample No. 5-B

~~Depth~~ El -9.5 | Date 24 Nov. 1970

JMS TRIAXIAL COMPRESSION TEST REPORT





sat. γ = 86.1

TEST NO.			1	2	3	Avg.
INITIAL	WATER CONTENT	w_o	133.1 %	131.4 %	130.2 %	131.6 %
	VOID RATIO	e_o	3.20	3.13	3.10	
	SATURATION	S_o	100+ %	100+ %	100+ %	%
	DRY DENSITY, LB/CU FT	γ_d	36.7	37.3	37.6	
VOID RATIO AFTER CONSOLIDATION		e_c				
TIME FOR 50 PERCENT CONSOLIDATION, MIN		t_{50}	17	31	12	
FINAL	WATER CONTENT	w_f	85.3 %	72.9 %	69.0 %	%
	VOID RATIO	e_f				
	SATURATION	S_f	%	%	%	%
NORMAL STRESS, T/SQ FT		σ	1.0	2.0	3.0	
MAXIMUM SHEAR STRESS, T/SQ FT		τ_{max}	0.37	0.66	0.89	
ACTUAL TIME TO FAILURE, MIN		t_f	750	900	630	
RATE OF STRAIN, IN./MIN			.00019	.00019	.00019	
ULTIMATE SHEAR STRESS, T/SQ FT		τ_{ult}				

SHEAR STRENGTH PARAMETERS

ϕ' = 18°

TAN ϕ' = 0.330

c' = 0 T/SQ FT

☐ CONTROLLED STRESS

☒ CONTROLLED STRAIN

TYPE OF SPECIMEN UNDISTURBED 3.00 IN. SQUARE 1=0.625 2&3=0.748 IN. THICK

CLASSIFICATION PLASTIC CLAY(CH),gray, contains rootlets

LL 138	PL 36	PI 102		G_s 2.47

REMARKS

PROJECT LK.PONT.LA.,& VIC. - HURR. PROT.(70)

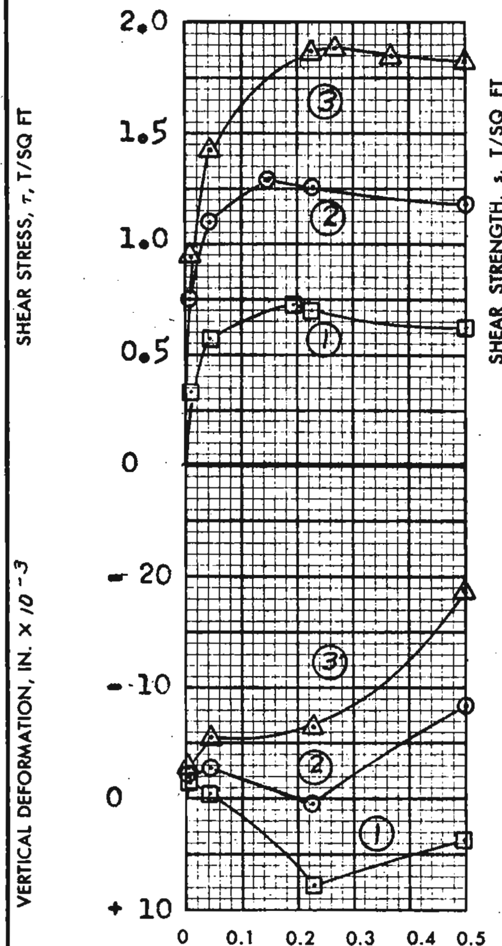
ORLEANS PARISH LAKE FORNT LEVEE WEST OF IHNC,

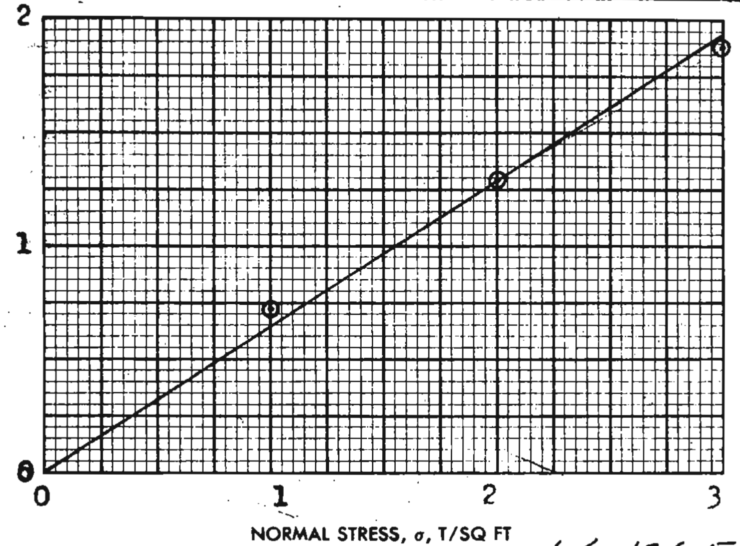
AREA G.D.M. # 2, SUPP. # 5 (OUTFALL CANALS)

BORING NO. 3-OUW — SAMPLE NO. 4-B

EL - 5.2 — DATE 8 Dec. 1970

BWG — DIRECT SHEAR TEST REPORT





Sat. γ = 126.5

SHEAR STRENGTH PARAMETERS

φ' = 33°

TAN φ' = 0.645

c' = 0 T/SQ FT

☐ CONTROLLED STRESS

☒ CONTROLLED STRAIN

TEST NO.			1	2	3	Avg.
INITIAL	WATER CONTENT	w_o	22.7 %	22.7 %	22.9 %	22.8%
INITIAL	VOID RATIO	e_o	0.617	0.618	0.618	
INITIAL	SATURATION	S_o	97.9 %	97.7 %	98.6 %	%
INITIAL	DRY DENSITY, LB/CU FT	γ_d	102.7	102.6	102.6	
VOID RATIO AFTER CONSOLIDATION		e_c				
TIME FOR 50 PERCENT CONSOLIDATION, MIN		t_{50}				
FINAL	WATER CONTENT	w_f	21.6 %	21.6 %	21.5%	%
FINAL	VOID RATIO	e_f				
FINAL	SATURATION	S_f	%	%	%	%
NORMAL STRESS, T/SQ FT		σ	1.0	2.0	3.0	
MAXIMUM SHEAR STRESS, T/SQ FT		τ_{max}	0.73	1.29	1.88	
ACTUAL TIME TO FAILURE, MIN		t_f	1110	840	1500	
RATE OF STRAIN, IN./MIN			.00019	.00019	.00019	
ULTIMATE SHEAR STRESS, T/SQ FT		τ_{ult}				

TYPE OF SPECIMEN: UNDISTURBED — 3.00 IN. SQUARE — 0.560 IN. THICK

CLASSIFICATION: SILTY SAND(SM),gray, contains traces of organic material and small*

LL - | PL - | PI - | G_s 2.66

REMARKS: *shells

PROJECT: LK. PONT.LA.,& VIC.- HURR.PROT.(70)
ORLEANS PARISH LAKE FRONT LEVEE WEST OF IHNC,

AREA: G.D.M. # 2,SUPP. # 5(OUTFALL CANALS)

BORING NO. 3-OUW | SAMPLE NO. 6-B

~~DEPTH~~ EL - 13.5 | DATE 7 Dec. 1970

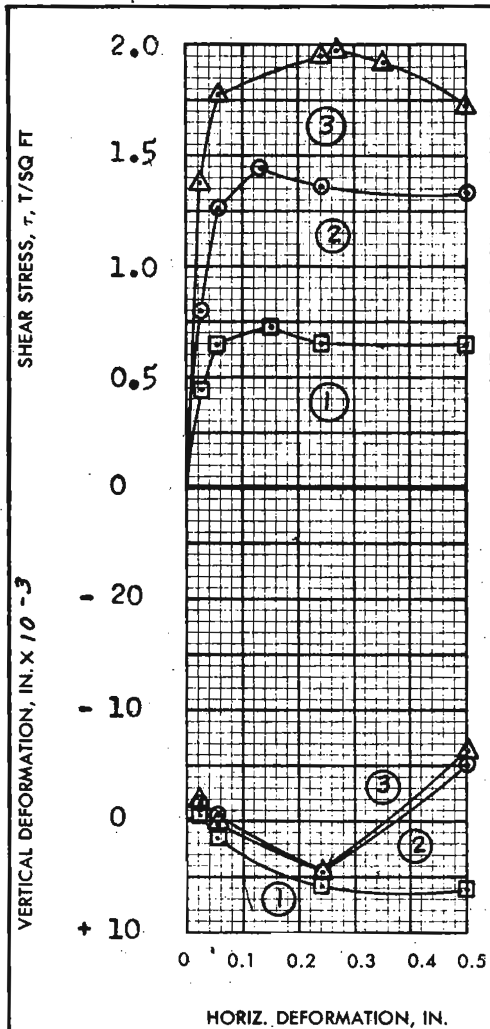
WJH

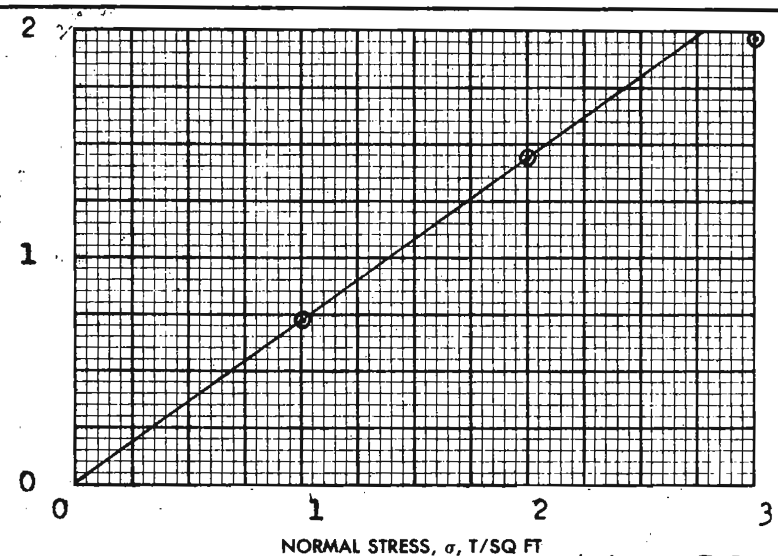
DIRECT SHEAR TEST REPORT

USAEWES SOILS TEST SECTION

ENG FORM 1 JUN 65 2092 (EM 1110-2-1906) PREVIOUS EDITIONS ARE OBSOLETE. (TRANSLUCENT) 16

PLATE IX-3





Sat. γ = 125.3

TEST NO.			1	2	3	Avg.
INITIAL	WATER CONTENT	w_o	23.7 %	23.8 %	23.8 %	23.8 %
	VOID RATIO	e_o	0.658	0.655	0.662	
	SATURATION	S_o	96.2 %	97.0 %	96.0 %	%
	DRY DENSITY, LB/CU FT	γ_d	100.5	100.7	100.3	
VOID RATIO AFTER CONSOLIDATION		e_c				
TIME FOR 50 PERCENT CONSOLIDATION, MIN		t_{50}				
FINAL	WATER CONTENT	w_f	23.5 %	23.1 %	23.1 %	%
	VOID RATIO	e_f				
	SATURATION	S_f	%	%	%	%
NORMAL STRESS, T/SQ FT		σ	1.0	2.0	3.0	
MAXIMUM SHEAR STRESS, T/SQ FT		τ_{max}	0.73	1.44	1.97	
ACTUAL TIME TO FAILURE, MIN		t_f	960	750	1470	
RATE OF STRAIN, IN./MIN			.00019	.00019	.00019	
ULTIMATE SHEAR STRESS, T/SQ FT		τ_{ult}				

SHEAR STRENGTH PARAMETERS

ϕ' = 36°

TAN ϕ' = 0.720

c' = 0 T/SQ FT

☐ CONTROLLED STRESS

☒ CONTROLLED STRAIN

TYPE OF SPECIMEN UNDISTURBED | 3.00 IN. SQUARE | 0.560 IN. THICK

CLASSIFICATION SILTY SAND(SM), gray, contains small fragments of shells

LL - | PL - | PI - | G_s 2.67

REMARKS

PROJECT LK. PONT. LA., & VIC. - HURR. PROT. (70)

ORLEANS PARISH LAKE FRONT LEVEE WEST OF IHNC,

AREA G.D.M. # 2, SUPP. # 5 (OUTFALL CANALS)

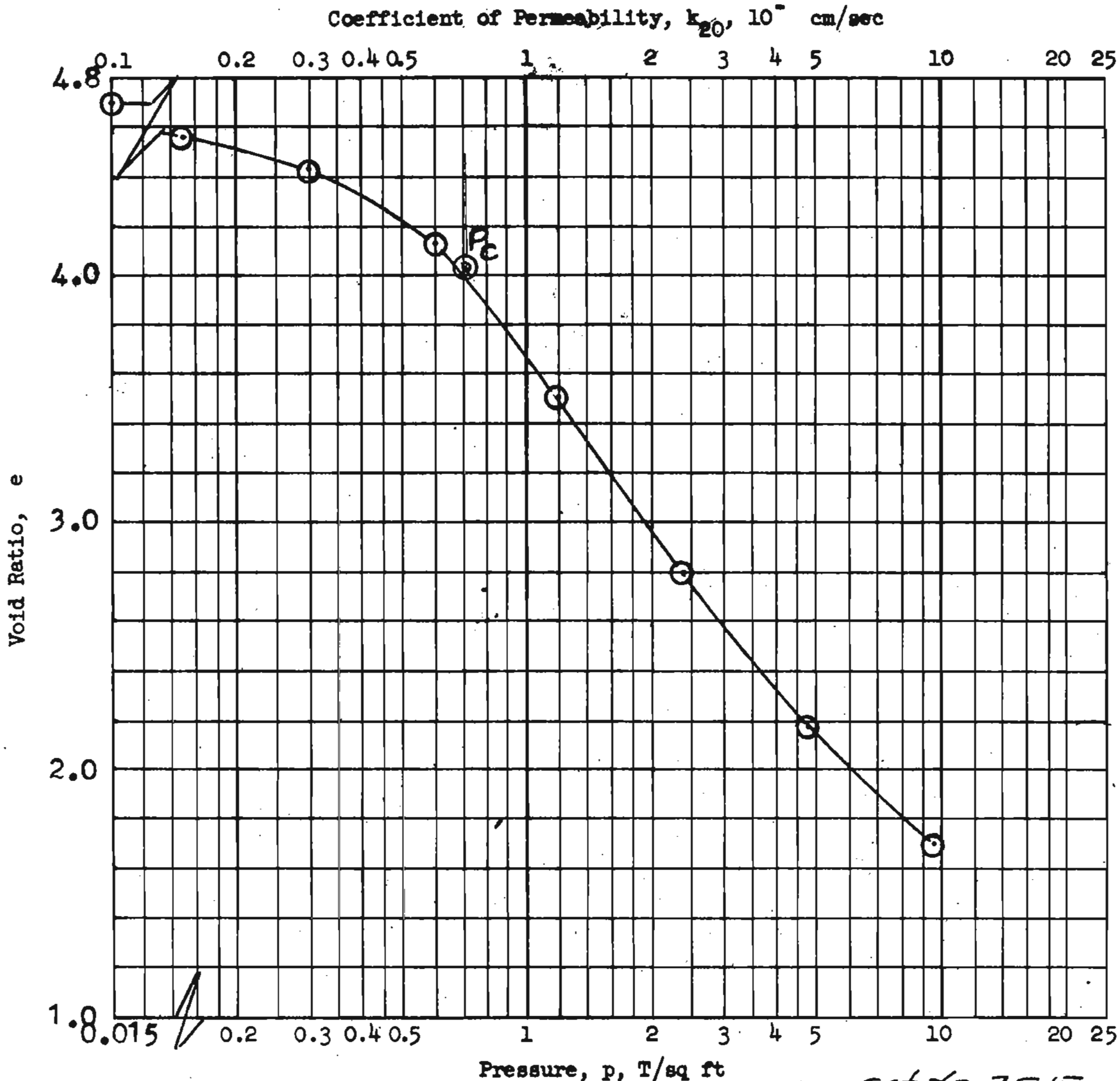
BORING NO. 3-OUW | SAMPLE NO. 7-D

~~DEPTH~~ EL - 18.8 | DATE 8 Dec. 1970

WJH

DIRECT SHEAR TEST REPORT

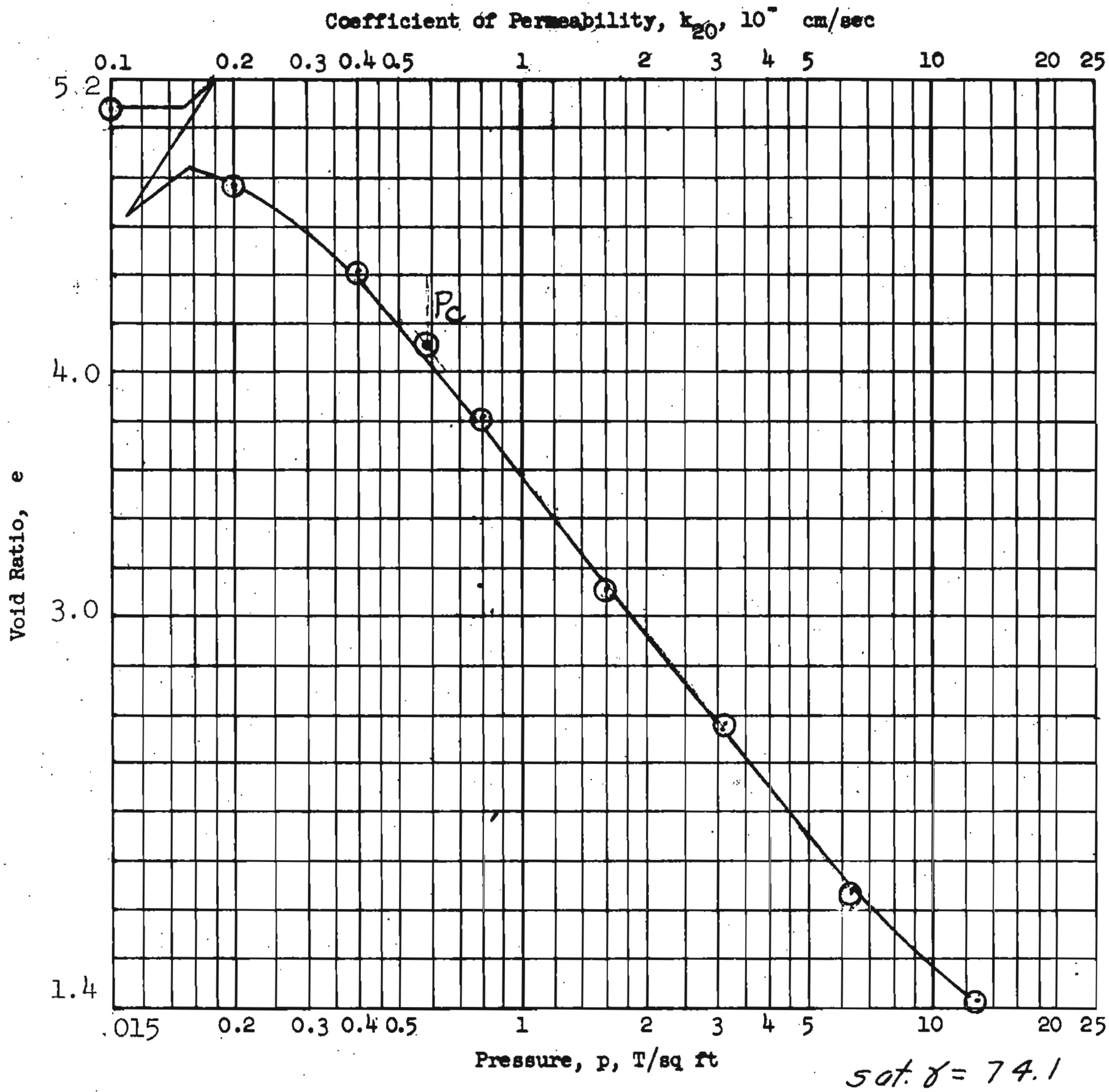
USAEWES SOILS TEST SECTION



sat. γ = 75.5

Type of Specimen UNDISTURBED		Before Test		After Test	
Diam 4.25 in.	Ht 1.165 in.	Water Content, w_o	209.8 %	w_f	%
Overburden Pressure, p_o T/sq ft		Void Ratio, e_o	4.69	e_f	
Preconsol. Pressure, p_c 0.71 T/sq ft		Saturation, S_o	98.4 %	S_f	%
Compression Index, C_c 2.32		Dry Density, γ_d	24.1 lb/ft³		
Classification PLASTIC CLAY (CH)*		k_{20} at e_o = × 10^{-} cm/sec			
LL	G_s 2.20	Project LK. PONT., LA.& VIC.-HURR. PROT.-1970			
PL	D_{10}	ORLEANS PARISH LAKEFRONT LEVEE WEST OF IHNC			
* Remarks brown, contains roots		Area GDM #2; SUPP. #5 (OUTFALL CANALS)			
and decayed wood, highly		Boring No. 3-OUW		Sample No. 4-A	
organic		El -4.5		Date 2 December, 1970	
		JDB CONSOLIDATION TEST REPORT			

ENG FORM 1 MAY 63 2090 PREVIOUS EDITIONS ARE OBSOLETE. (TRANSLUCENT) G 3424

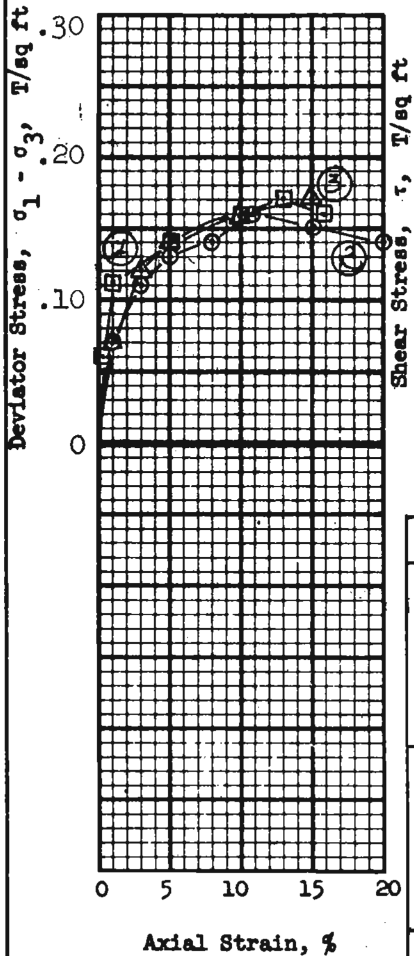


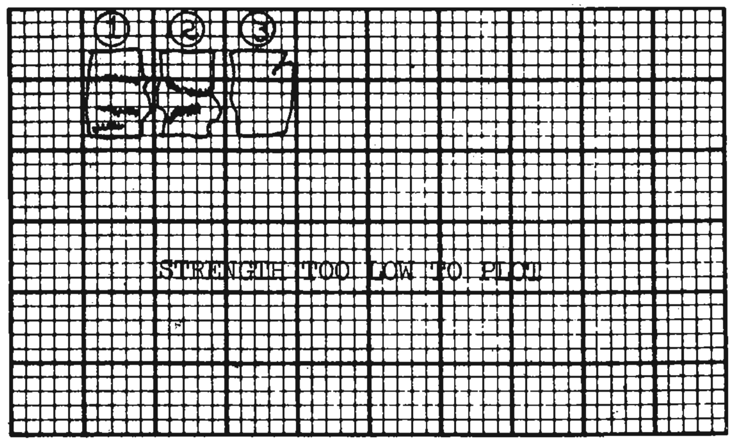
sat. γ = 74.1

Type of Specimen UNDISTURBED		Before Test		After Test	
Diam 4.25 in.	Ht 1.160 in.	Water Content, w_o	230.9 %	w_f	%
Overburden Pressure, p_o T/sq ft		Void Ratio, e_o	5.07	e_f	
Preconsol. Pressure, p_c 0.58 T/sq ft		Saturation, S_o	98.8 %	S_f	%
Compression Index, C_c 2.32		Dry Density, γ_d	22.2 lb/ft^3		
Classification ORGANIC CLAY(OH),*		k_{20} at e_o = × 10^{-} cm/sec			

LL -	G_s 2.17	Project LK. PONT. LA.&VIC.-HURR. PROT. ORLEANS PARISH LAKEFRONT LEVEE, WEST OF IHNC, GDM NO.2	
PL -	D_{10}		
Remarks *brown, with decayed root fragments		Area SUPP. NO.5, OUTFALL CANALS	
		Boring No. 3-OUW	Sample No. 5-A in lieu of 5-B
		~~Depth~~ El -8.8	Date 21 Jan. 1971

CONSOLIDATION TEST REPORT





Normal Stress, σ, T/sq ft

sat γ = 72.7

Test No.			1	2	3	Avg.
Initial	Water content	w_o	260.0%	309.1%	290.4%	286.5%
	Void ratio	e_o	5.89	7.14	6.61	
	Saturation	S_o	98.4 %	96.5%	98.0%	%
	Dry density, lb/cu ft	γ_d	20.2	17.1	18.3	
Before Shear	Water content	w_c	%	%	%	%
	Void ratio	e_c				
	Saturation	S_c	%	%	%	%
	Final back pressure, T/sq ft	u_o				
Final	Water content	w_f	%	%	%	%
	Void ratio	e_f				
Minor principal stress, T/sq ft		σ_3	0.5	1.5	3.0	
Max deviator stress, T/sq ft		$(\sigma_1-\sigma_3)_{max}$	0.17	0.16	0.17	
Time to failure, min		t_f	17	18	28	
Rate of strain, percent/min			0.75	0.61	0.53	
Ult deviator stress, T/sq ft		$(\sigma_1-\sigma_3)_{ult}$				
Initial diameter, in.		D_o	1.40	1.40	1.39	
Initial height, in.		H_o	3.00	3.00	3.00	

Shear Strength Parameters

ϕ = 0 °

tan ϕ = 0

c = 0.08 T/sq ft

Method of saturation ________

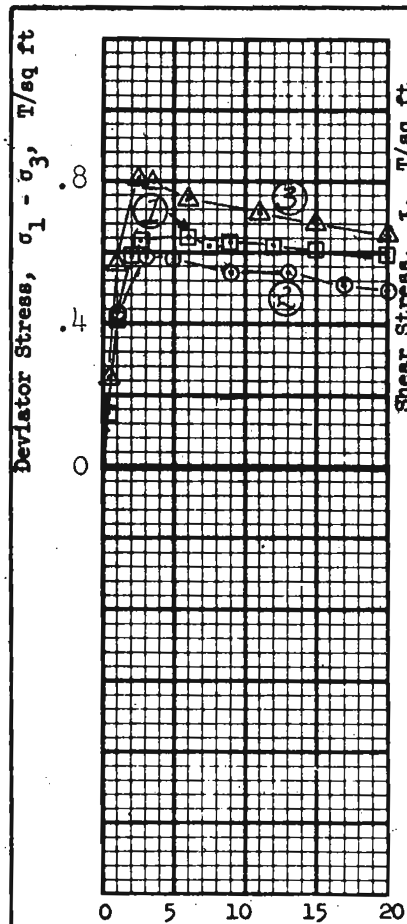
☐ Controlled stress

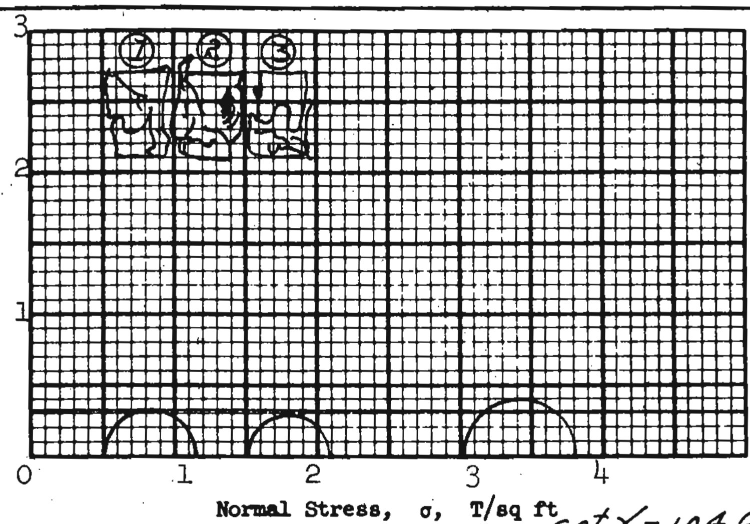
☒ Controlled strain

Type of test Q	Type of specimen UNDISTURBED		
Classification ORGANIC CLAY(OH),brown, contains numerous roots and wood*			
LL -	PL -	PI -	G_s 2.23 From Consol.

Remarks *fragments

Project LK. PONT.,LA.-HURR. PROT.-1970	
ORLEANS PARISH LAKEFRONT LEVEE WEST OF IHNC;	
Area GDM NO. 2;SUPP. NO.5(OUTFALL CANALS)	
Boring No. 4-OUE	Sample No. 3-D
~~Depth~~ El -8.7	Date 12 Nov. 1970
BCH TRIAXIAL COMPRESSION TEST REPORT	





sat. γ = 104.6

Test No.			1	2	3	Avg.
Initial	Water content	w_o	52.9 %	52.8 %	59.4 %	55 %
	Void ratio	e_o	1.46	1.46	1.61	
	Saturation	S_o	97.5 %	97.3 %	99.2 %	%
	Dry density, lb/cu ft	γ_d	68.2	68.4	64.4	
Before Shear	Water content	w_c	%	%	%	%
	Void ratio	e_c				
	Saturation	S_c	%	%	%	%
	Final back pressure, T/sq ft	u_o				
Final	Water content	w_f	%	%	%	%
	Void ratio	e_f				
Minor principal stress, T/sq ft		σ_3	0.5	1.5	3.0	
Max deviator stress, T/sq ft		$(\sigma_1-\sigma_3)_{max}$	0.64	0.59	0.81	
Time to failure, min		t_f	17	18	12	
Rate of strain, percent/min			0.36	0.17	0.21	
Ult deviator stress, T/sq ft		$(\sigma_1-\sigma_3)_{ult}$				
Initial diameter, in.		D_o	1.40	1.40	1.40	
Initial height, in.		H_o	3.00	3.00	3.00	

Shear Strength Parameters

ϕ = 0 °

tan ϕ = 0

c = 0.31 T/sq ft

Method of saturation ______

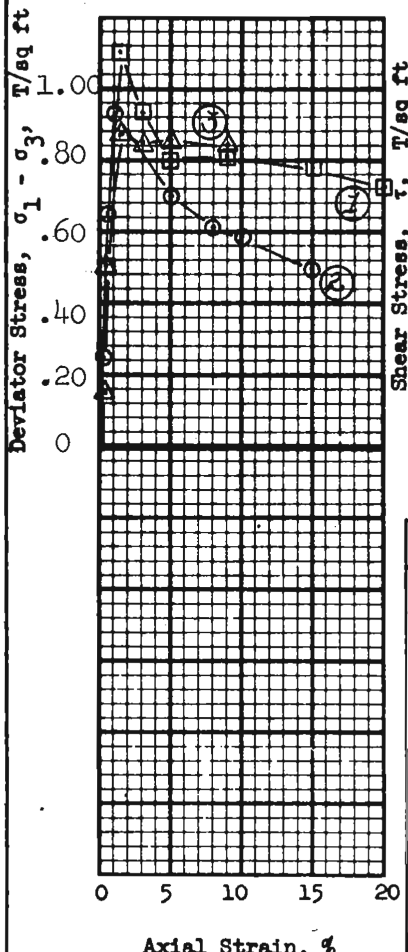
☐ Controlled stress

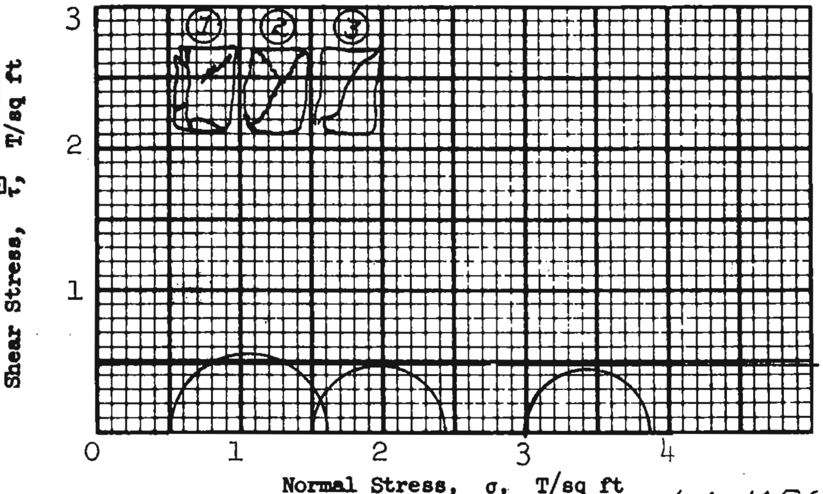
☒ Controlled strain

Type of test Q	Type of specimen UNDISTURBED
Classification	PLASTIC CLAY(CH), gray, contains numerous sand lenses and small*
LL -	PL -
PI -	G_s 2.69 From TT-C Consol.

Remarks *shells

Project LK. PONT., LA.-HURR. PROT.-1970	
ORLEANS PARISH LAKEFRONT LEVEE WEST OF IHNC;	
Area GDM NO. 2; SUPP. NO.5(OUTFALL CANALS)	
Boring No. 4-OUE	Sample No. 11-D
~~Depth~~ El -44.3	Date 13 Nov. 1970
BCH	TRIAXIAL COMPRESSION TEST REPORT





Sat. γ = 105.6

Test No.			1	2	3	Avg.
Initial	Water content	w_o	53.8 %	53.5 %	53.6 %	53.6 %
	Void ratio	e_o	1.46	1.44	1.46	
	Saturation	S_o	99.5 %	100+ %	99.1 %	%
	Dry density, lb/cu ft	γ_d	68.5	69.0	68.4	
Before Shear	Water content	w_c	%	%	%	%
	Void ratio	e_c				
	Saturation	S_c	%	%	%	%
	Final back pressure, T/sq ft	u_o				
Final	Water content	w_f	%	%	%	%
	Void ratio	e_f				
Minor principal stress, T/sq ft		σ_3	0.5	1.5	3.0	
Max deviator stress, T/sq ft		$(\sigma_1-\sigma_3)_{max}$	1.10	0.93	0.87	
Time to failure, min		t_f	9	9	23	
Rate of strain, percent/min			0.17	0.11	0.66	
Ult deviator stress, T/sq ft		$(\sigma_1-\sigma_3)_{ult}$				
Initial diameter, in.		D_o	1.40	1.40	1.40	
Initial height, in.		H_o	3.00	3.00	3.00	

Shear Strength Parameters

ϕ = 0 °

tan ϕ = 0

c = 0.48 T/sq ft

Method of saturation ________

☐ Controlled stress

☒ Controlled strain

Type of test Q | Type of specimen UNDISTURBED

Classification PLASTIC CLAY(CH),gray, contains a few 1/16" dia. shells and a*

LL 77 | PL 25 | PI 52 | G_s 2.70

Remarks *few silt lenses

Project LK. PONT.,LA.&VIC.-HURR. PROT.- 1970

ORLEANS PARISH LAKEFRONT LEVEE WEST OF IHNC;

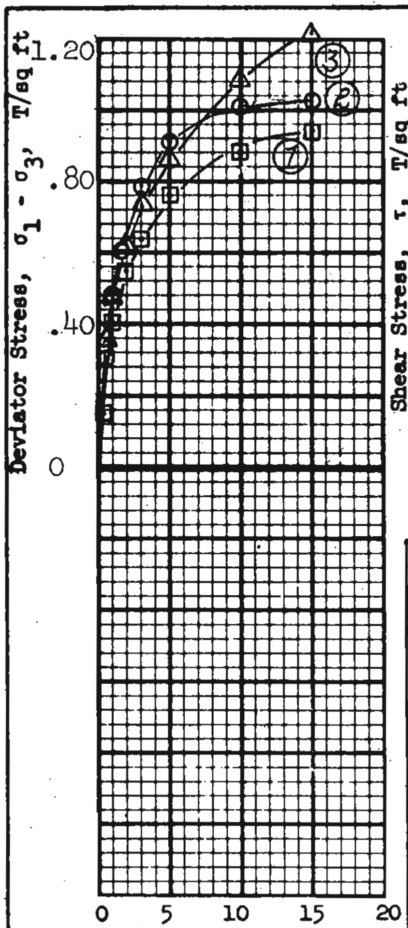
Area GDM NO.2; SUPP. NO.5(OUTFALL CANALS)

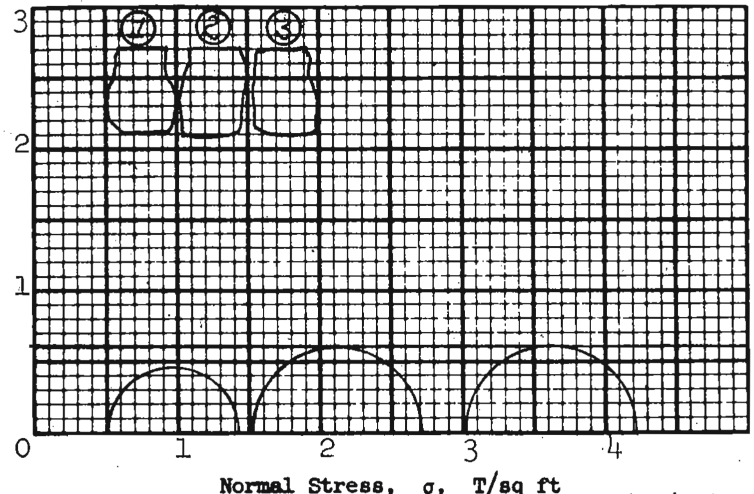
Boring No. 4-OUE | Sample No. 14-B

Depth El -54.3 | Date 16 Nov.1970

JMS TRIAXIAL COMPRESSION TEST REPORT

ENG FORM 1 JUN 65 2089 (EM 1110-2-1902) PREVIOUS EDITIONS ARE OBSOLETE





5 9T. γ = 126.6

Shear Strength Parameters

ϕ = 0 °

tan ϕ = 0

c = 0.61 T/sq ft

Method of saturation ______

[ ] Controlled stress

[x] Controlled strain

Test No.			1	2	3	Avg.
Initial	Water content	w_o	22.0 %	21.8 %	23.5 %	22.4 %
	Void ratio	e_o	0.643	0.640	0.686	
	Saturation	S_o	92.4 %	92.0 %	92.5 %	%
	Dry density, lb/cu ft	γ_d	102.6	102.8	100.0	
Before Shear	Water content	w_c	%	%	%	%
	Void ratio	e_c				
	Saturation	S_c	%	%	%	%
	Final back pressure, T/sq ft	u_o				
Final	Water content	w_f	%	%	%	%
	Void ratio	e_f				
Minor principal stress, T/sq ft		σ_3	0.5	1.5	3.0	
Max deviator stress, T/sq ft		$(\sigma_1-\sigma_3)_{max}$	0.94	1.21	1.22	
Time to failure, min		t_f	42	33	26	
Rate of strain, percent/min			0.36	0.46	0.58	
Ult deviator stress, T/sq ft		$(\sigma_1-\sigma_3)_{ult}$				
Initial diameter, in.		D_o	1.40	1.40	1.40	
Initial height, in.		H_o	3.00	3.00	3.00	

Type of test Q | Type of specimen UNDISTURBED

Classification SANDY CLAY(CL),gray, contains a trace of iron oxide

LL – | PL – | PI – | G_s 2.70 From Consol.

Remarks ______

Project LK. PONT., LA.&VIC.-HURR. PROT.-1970

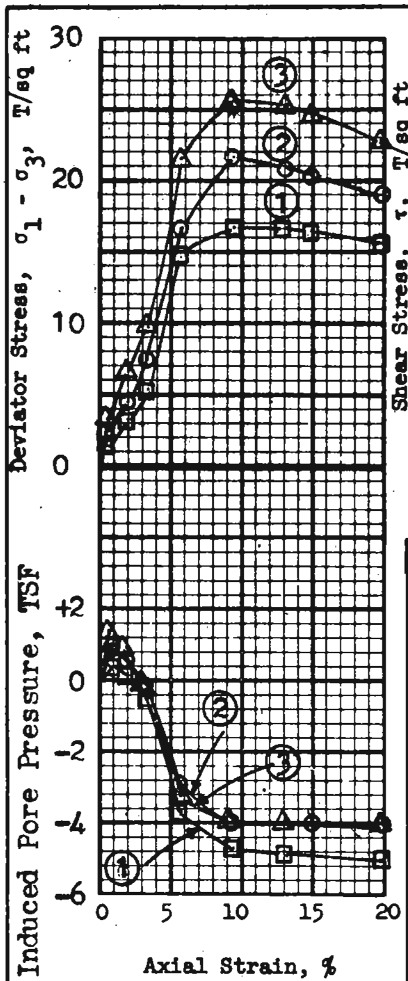
ORLEANS PARISH LAKEFRONT LEVEE WEST OF IHNC;

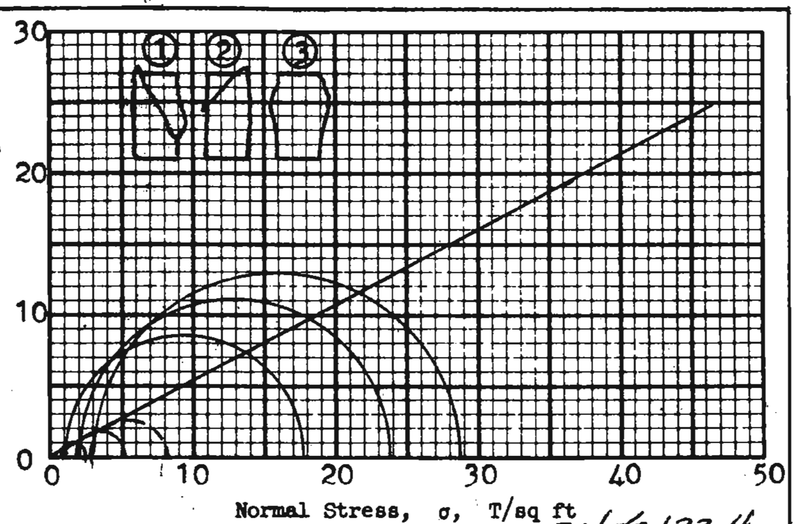
Area GDM NO. 2;SUPP. NO. -5 (OUTFALL CANALS)

Boring No. 4-OUE | Sample No. 16-D

Depth El -64.0 | Date 16 Nov. 1970

BCH TRIAXIAL COMPRESSION TEST REPORT





Sat. γ = 122.4

Test No.			1	2	3	Avg.
Initial	Water content	w_o	26.4 %	25.3 %	26.2 %	26.0%
	Void ratio	e_o	0.727	0.709	0.716	
	Saturation	S_o	96.2 %	94.6 %	97.0 %	%
	Dry density, lb/cu ft	γ_d	95.8	96.8	96.4	
Before Shear	Water content	w_c	23.9 %	23.5 %	23.6 %	%
	Void ratio	e_c	0.692	0.661	0.685	
	Saturation	S_c	91.5*%	94.2*%	91.3*%	%
	Final back pressure, PSI	u_o	70	70	70	
	Dry Density Lbs/cu.ft.	γ_d	97.8	99.6	98.2	
	Void ratio	e_f				
Minor principal stress, T/sq ft		σ_3	1.0	2.0	3.0	
Max deviator stress, T/sq ft		$(\sigma_1-\sigma_3)_{max}$	16.85	21.66	25.61	
Time to failure, min		t_f	134	134	134	
Rate of strain, percent/min			0.07	0.07	0.07	
$(\sigma_1-\sigma_3)$ at max. pore pressure			1.5	3.0	5.0	
Ult deviator stress, T/sq ft		$(\sigma_1-\sigma_3)_{ult}$				
Initial diameter, in.		D_o	1.40	1.40	1.40	
Initial height, in.		H_o	3.00	3.00	3.00	

Shear Strength Parameters

ϕ = 28 °

tan ϕ = 0.530

c = 0 T/sq ft

Method of saturation BP

[ ] Controlled stress

[x] Controlled strain

Type of test R	Type of specimen UNDISTURBED			
Classification SILTY SAND(SM), gray, contains mollusk shells				
LL -	PL -	PI -		G_s 2.65

Remarks See attached plot for effective values
Portion of sample allowed to drain before trimming
Pore Pressure response indicated 100% saturation

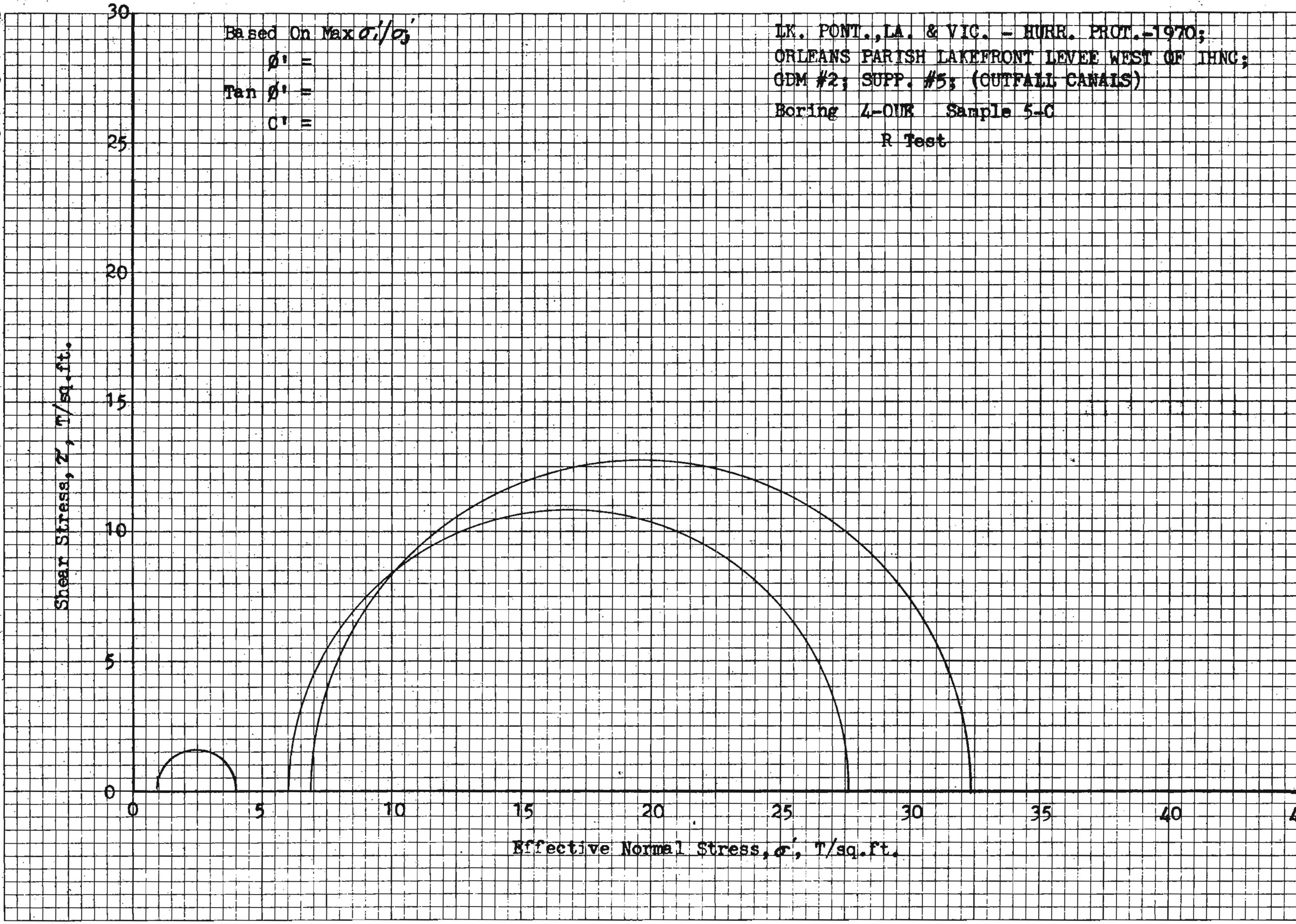
Project LK. PONT., LA. & VIC. - HURR. PROT-1970	
ORLEANS PARISH LAKEFRONT LEVEE WEST OF IHNC;	
Area GDM #2; SUPP. #5 (OUTFALL CANALS)	
Boring No. 4-OUE	Sample No. 5-C
El -16.0	Date 24 Nov., 1970
JAL TRIAXIAL COMPRESSION TEST REPORT	

ENG FORM 1 JUN 65 2089 (EM 1110-2-1902) PREVIOUS EDITIONS ARE OBSOLETE

Sheet 1 of 2

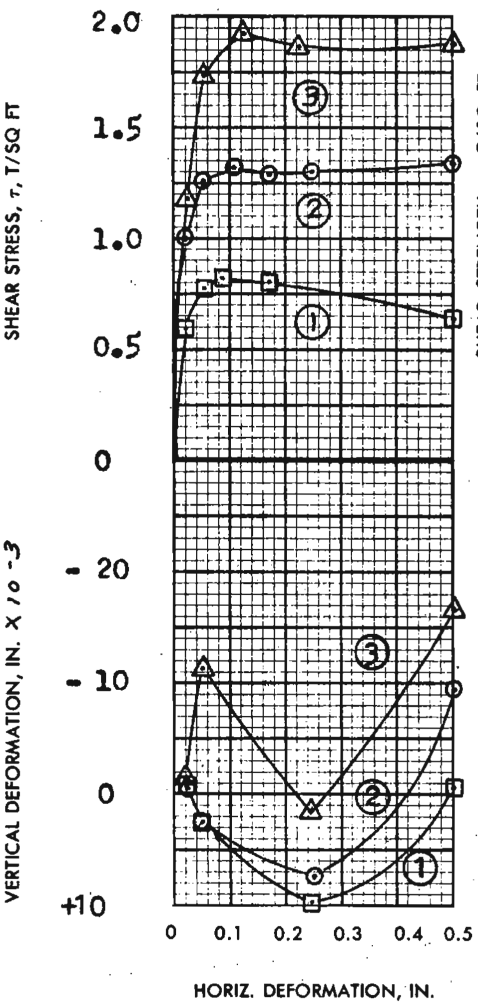
24 TRANSLUCENT USAEWES SOILS TEST SECTION

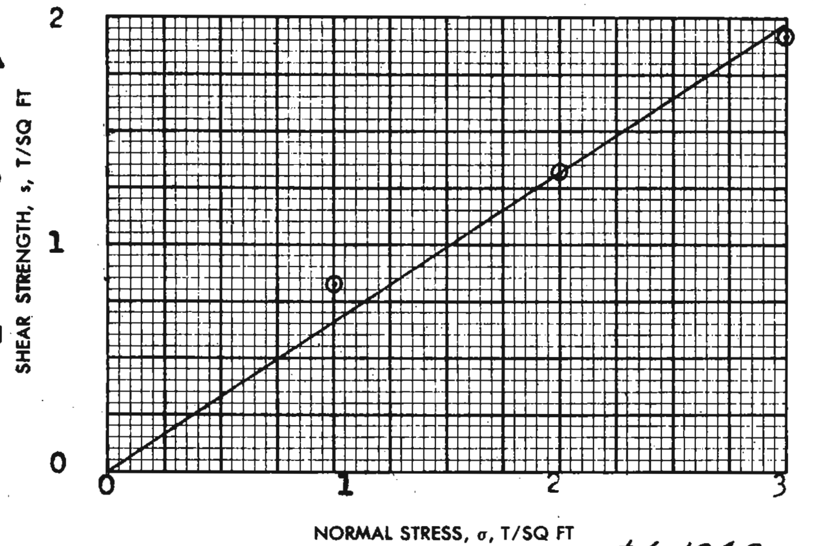
Sheet 2 of 2



2-5

USAEWES SOILS TEST SECTION





sat.γ=124.3

TEST NO.			1	2	3	Avg.
INITIAL	WATER CONTENT	w_o	23.6 %	23.6 %	23.6 %	23.6 %
	VOID RATIO	e_o	0.692	0.689	0.680	
	SATURATION	S_o	91.1 %	91.5 %	92.7 %	%
	DRY DENSITY, LB/CU FT	γ_d	98.5	98.7	99.2	
VOID RATIO AFTER CONSOLIDATION		e_c				
TIME FOR 50 PERCENT CONSOLIDATION, MIN		t_{50}				
FINAL	WATER CONTENT	w_f	22.7 %	23.8 %	24.3 %	%
	VOID RATIO	e_f				
	SATURATION	S_f	%	%	%	%
NORMAL STRESS, T/SQ FT		σ	1.0	2.0	3.0	
MAXIMUM SHEAR STRESS, T/SQ FT		τ_{max}	0.82	1.32	1.93	
ACTUAL TIME TO FAILURE, MIN		t_f	540	600	720	
RATE OF STRAIN, IN./MIN			.00019	.00019	.00019	
ULTIMATE SHEAR STRESS, T/SQ FT		τ_{ult}				

SHEAR STRENGTH PARAMETERS

ϕ' = 33°

TAN ϕ' = 0.660

c' = 0 T/SQ FT

☐ CONTROLLED STRESS

☒ CONTROLLED STRAIN

TYPE OF SPECIMEN UNDISTURBED	3.00	IN. SQUARE	0.560	IN. THICK

CLASSIFICATION SILTY SAND(SM),gray, contains small shells

LL -	PL -	PI -		G_s 2.67

REMARKS

PROJECT LK.PONT.,LA.,& VIC.-HURR. PROT- 1970

ORLEANS PARISH LAKEFRONT LEVEE WEST OF IHNC;

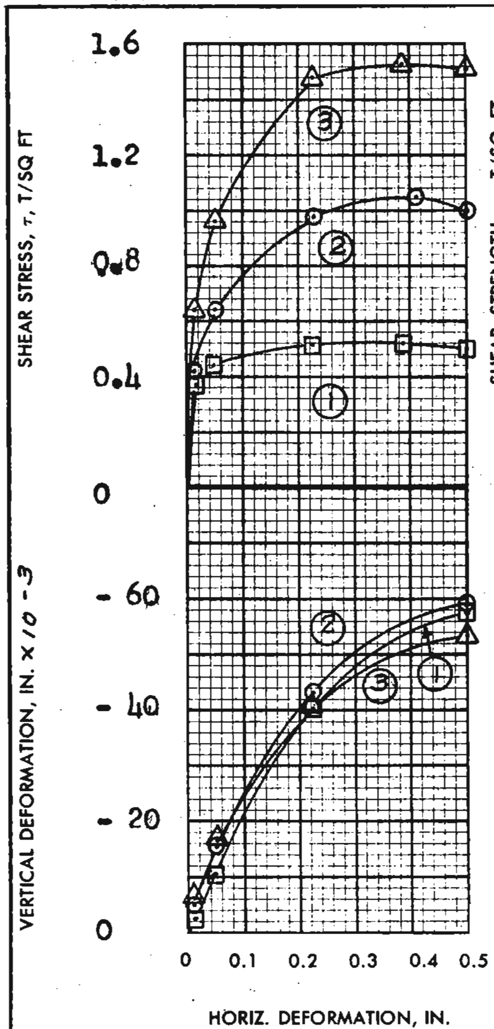
AREA G.D.M. # 2,SUPP.#5(OUTFALL CANALS)

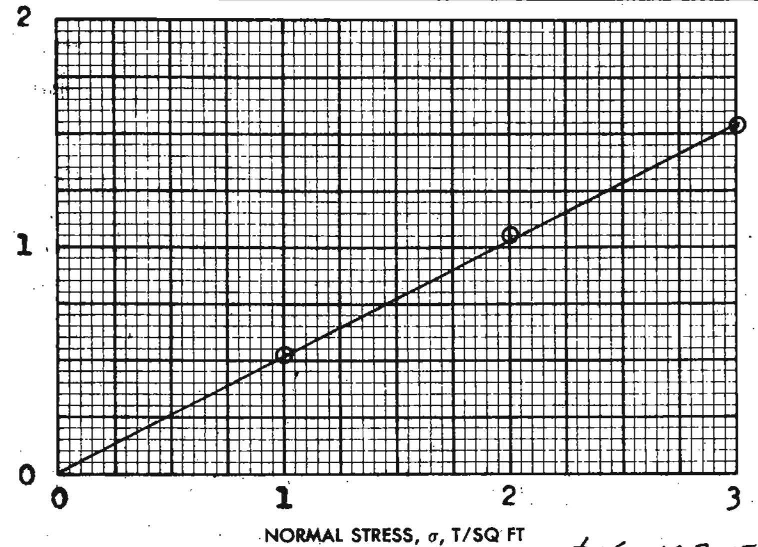
BORING NO. 4-OUE	SAMPLE NO. 6-C
El. - 19.7	DATE 24 NOV.1970

WJH

DIRECT SHEAR TEST REPORT

ENG FORM 1 JUN 65 **2092** *(EM 1110-2-1906)* PREVIOUS EDITIONS ARE OBSOLETE *(TRANSLUCENT)* 26 USAEWES SOILS TEST PLATE IX-8





sat. γ = 102.6

TEST NO.			1	2	3	Avg.
INITIAL	WATER CONTENT	w_o	58.4 %	61.1 %	60.2 %	59.9 %
	VOID RATIO	e_o	1.65	1.65	1.63	
	SATURATION	S_o	95.6 %	100 %	99.7 %	%
	DRY DENSITY, LB/CU FT	γ_d	63.5	63.7	64.0	
VOID RATIO AFTER CONSOLIDATION		e_c				
TIME FOR 50 PERCENT CONSOLIDATION, MIN		t_{50}	< 1	2	6	
FINAL	WATER CONTENT	w_f	51.4 %	38.5 %	33.8 %	%
	VOID RATIO	e_f				
	SATURATION	S_f	%	%	%	%
NORMAL STRESS, T/SQ FT		σ	1.0	2.0	3.0	
MAXIMUM SHEAR STRESS, T/SQ FT		τ_{max}	0.52	1.05	1.53	
ACTUAL TIME TO FAILURE, MIN		t_f	2100	2220	2100	
RATE OF STRAIN, IN./MIN			.00019	.00019	.00019	
ULTIMATE SHEAR STRESS, T/SQ FT		τ_{ult}				

SHEAR STRENGTH PARAMETERS

ϕ' = 27°

TAN ϕ' = 0.510

c' = 0 T/SQ FT

☐ CONTROLLED STRESS

☒ CONTROLLED STRAIN

TYPE OF SPECIMEN UNDISTURBED		3.00 IN. SQUARE	0.560 IN. THICK
CLASSIFICATION PLASTIC CLAY(CH),gray, contains small shells			
LL 62	PL 23	PI 39	G_s 2.70

REMARKS

PROJECT LK.PONT.LA.,&VIC.-HURR.PROT.-1970

ORLEANS PARISH LAKEFRONT LEVEE WEST OF IHNC;

AREA G.D.M. # 2,SUPP.# 5(OUTFALLS CANALS)

BORING NO. 4-OUE	SAMPLE NO. 12-C
~~DEPTH~~ EL - 47.5	DATE 30 Nov. 1970

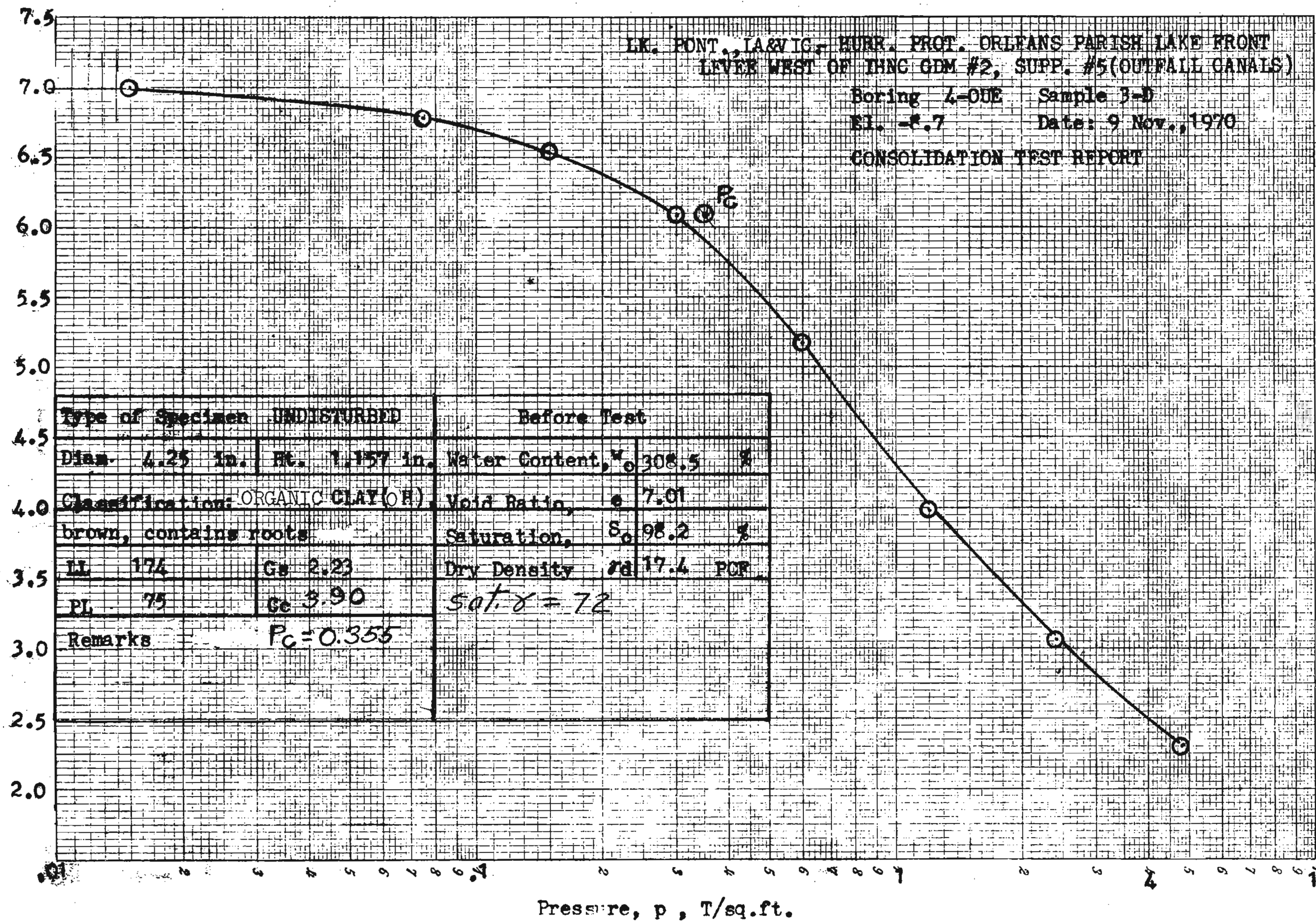
WJH DIRECT SHEAR TEST REPORT

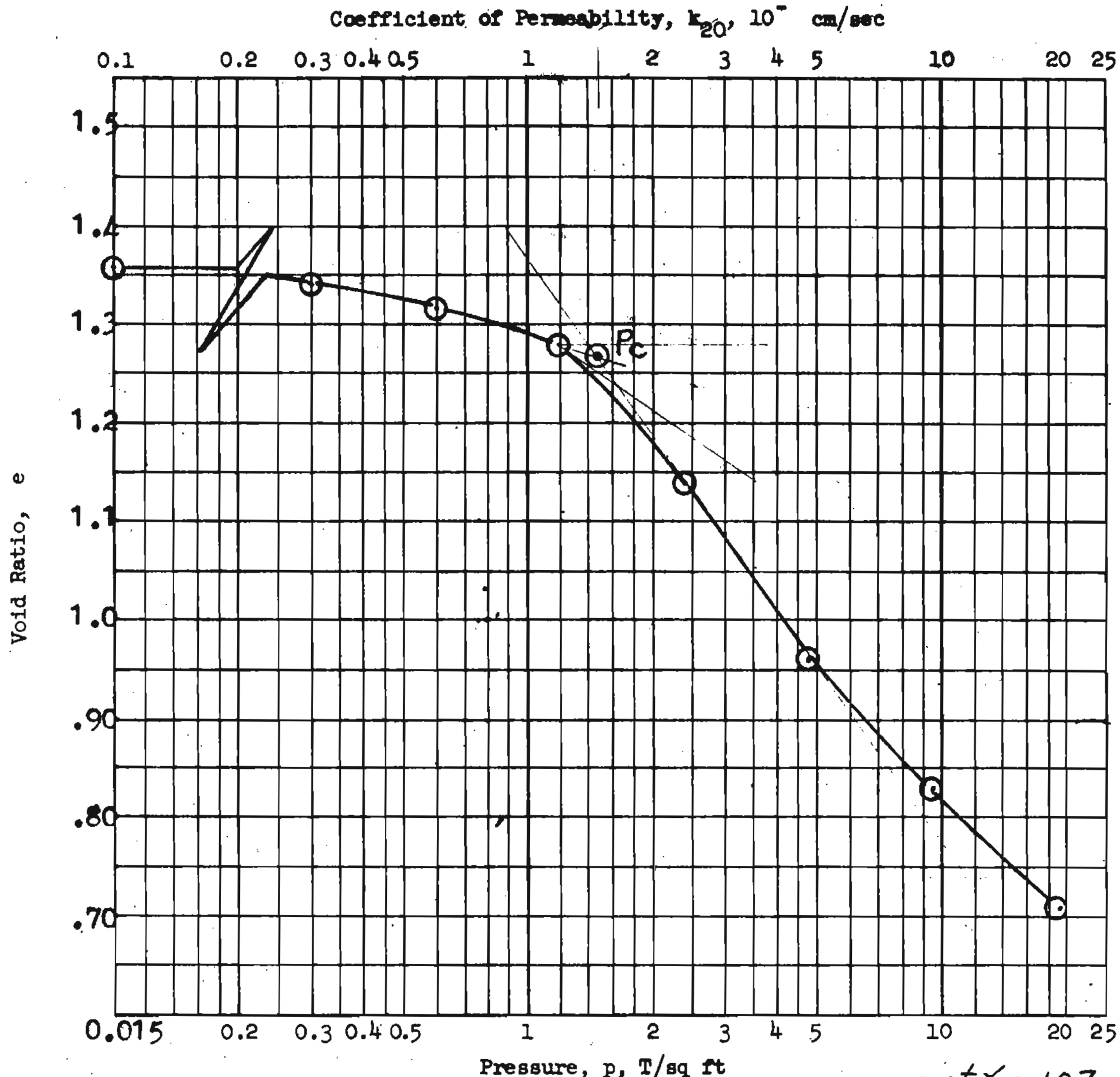
ENG FORM 1 JUN 65 2092 (EM 1110-2-1906) PREVIOUS EDITIONS ARE OBSOLETE (TRANSLUCENT) GPO : 1966 OF-214-945

27

USAEWES SOILS TEST SECTION

PLATE IX-3A


LK. PONT., LA&VIC., HURR. PROT. ORLEANS PARISH LAKE FRONT
LEVEE WEST OF IHNC GDM #2, SUPP. #5(OUTFALL CANALS)
Boring 4-OUE Sample 3-D
El. -8.7 Date: 9 Nov., 1970
CONSOLIDATION TEST REPORT
Pc
Type of Specimen UNDISTURBED
Before Test
Diam. 4.25 in. Ht. 1.157 in.
Water Content, wo 308.5 %
Classification: ORGANIC CLAY (OH),
brown, contains roots
Void Ratio, e 7.01
Saturation, So 98.2 %
LL 174
Gs 2.23
Dry Density γd 17.4 PCF
PL 75
Cc 3.90
sat. γ = 72
Remarks
Pc = 0.355
Void Ratio, e
Pressure, p, T/sq.ft.
7.5
7.0
6.5
6.0
5.5
5.0
4.5
4.0
3.5
3.0
2.5
2.0
.01
.1
1
10



sat.γ = 107

Type of Specimen UNDISTURBED		Before Test		After Test	
Diam 4.25 in.	Ht 1.158 in.	Water Content, w_o	49.4 %	w_f	%
Overburden Pressure, p_o T/sq ft		Void Ratio, e_o	1.36	e_f	
Preconsol. Pressure, p_c 1.55 T/sq ft		Saturation, S_o	97.1 %	S_f	%
Compression Index, C_c 0.68		Dry Density, γ_d	70.9 lb/ft^3		
Classification PLASTIC CLAY(CH),*		k_{20} at e_o = × 10^{-} cm/sec			

LL 53	G_s 2.69
PL 22	D_{10}

Remarks *greenish gray, contains small sand pockets

Project LK. PONT., LA.& VIC.-HURR.PROT.-1970

ORLEANS PARISH LAKEFRONT LEVEE WEST OF IHNC

Area GDM NO. 2, SUPP. NO.5(OUTFALL CANALS)

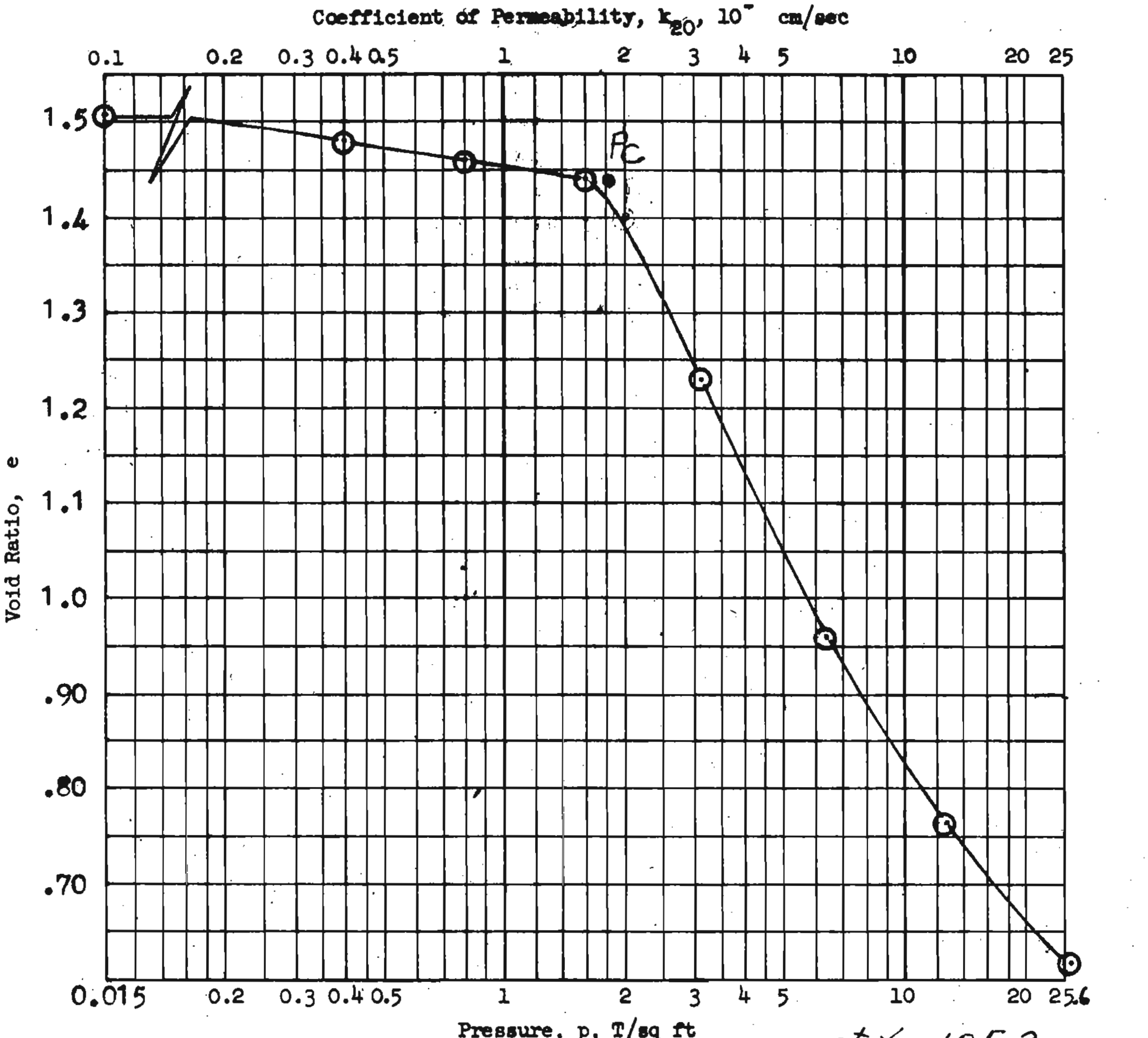
Boring No. 4-OUE	Sample No. 11-C
~~Depth~~ El -43.2	Date 5 Nov.,1970

JCB **CONSOLIDATION TEST REPORT**

ENG FORM 1 MAY 63 2090 PREVIOUS EDITIONS ARE OBSOLETE. *(TRANSLUCENT)*

G 3424

USAEWES SOILS TEST SECTION



sat. γ = 105.2

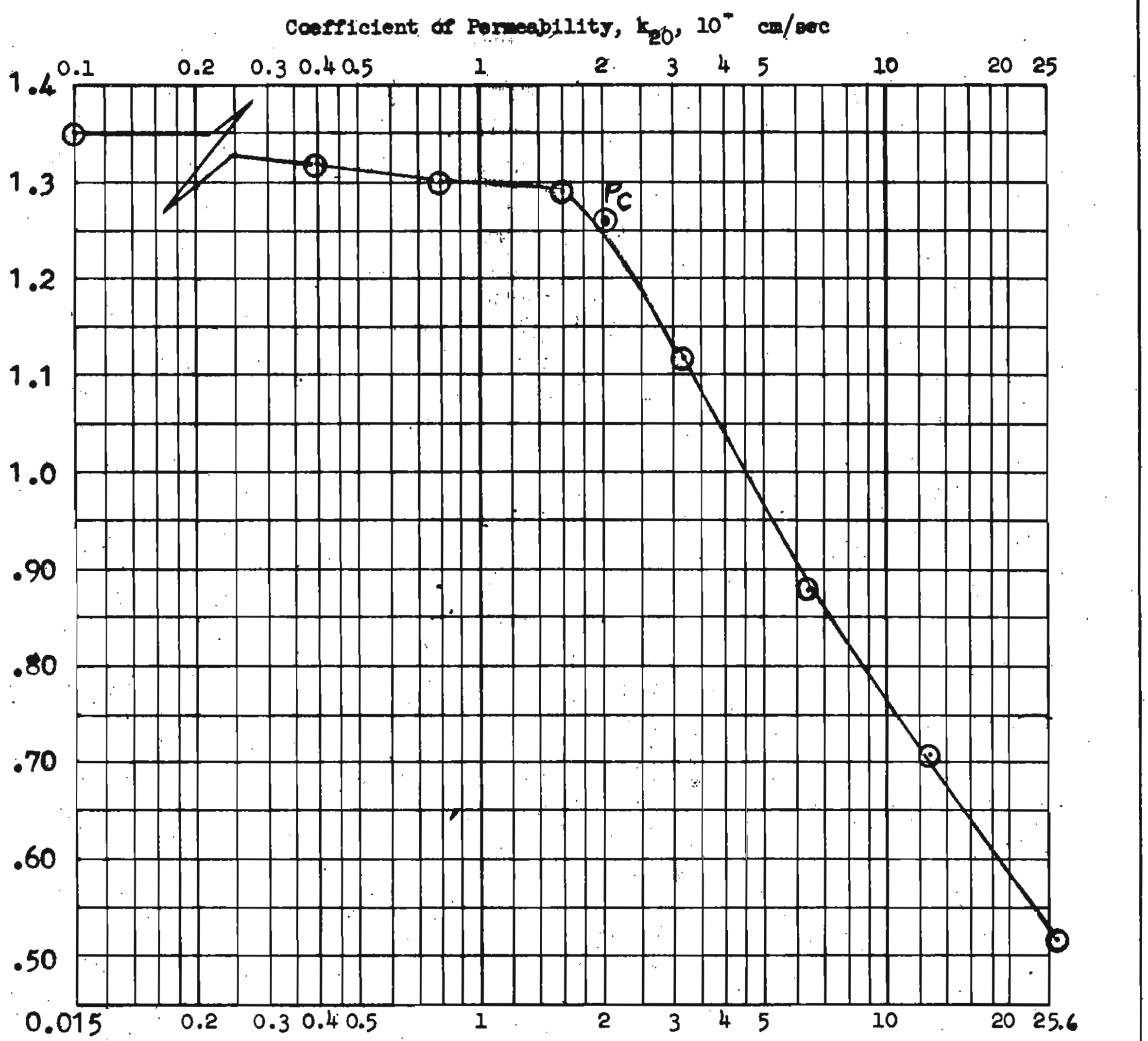
Type of Specimen UNDISTURBED		Before Test		After Test
Diam 4.25 in.	Ht 1.162 in.	Water Content, w_o	55.4 %	w_f %
Overburden Pressure, p_o T/sq ft		Void Ratio, e_o	1.51	e_f
Preconsol. Pressure, p_c = 1.80 T/sq ft		Saturation, S_o	99.7 %	S_f %
Compression Index, C_c 0.98		Dry Density, γ_d	67.6 lb/ft^3	
Classification PLASTIC CLAY(CH),gray		k_{20} at e_o = × 10^{-} cm/sec		

LL 78	G_s 2.72
PL 19	D_{10}
Remarks	

Project LK. PONT., LA. & VIC.-HURR.PROT.-1970
ORLEANS PARISH LAKEFRONT LEVEE WEST OF IHNC
Area GDM NO.2, SUPP. NO.5 (OUTFALL CANALS)

Boring No. 4-OUE	Sample No. 14-C
~~Depth~~ El -55.5	Date 5 Nov.,1970

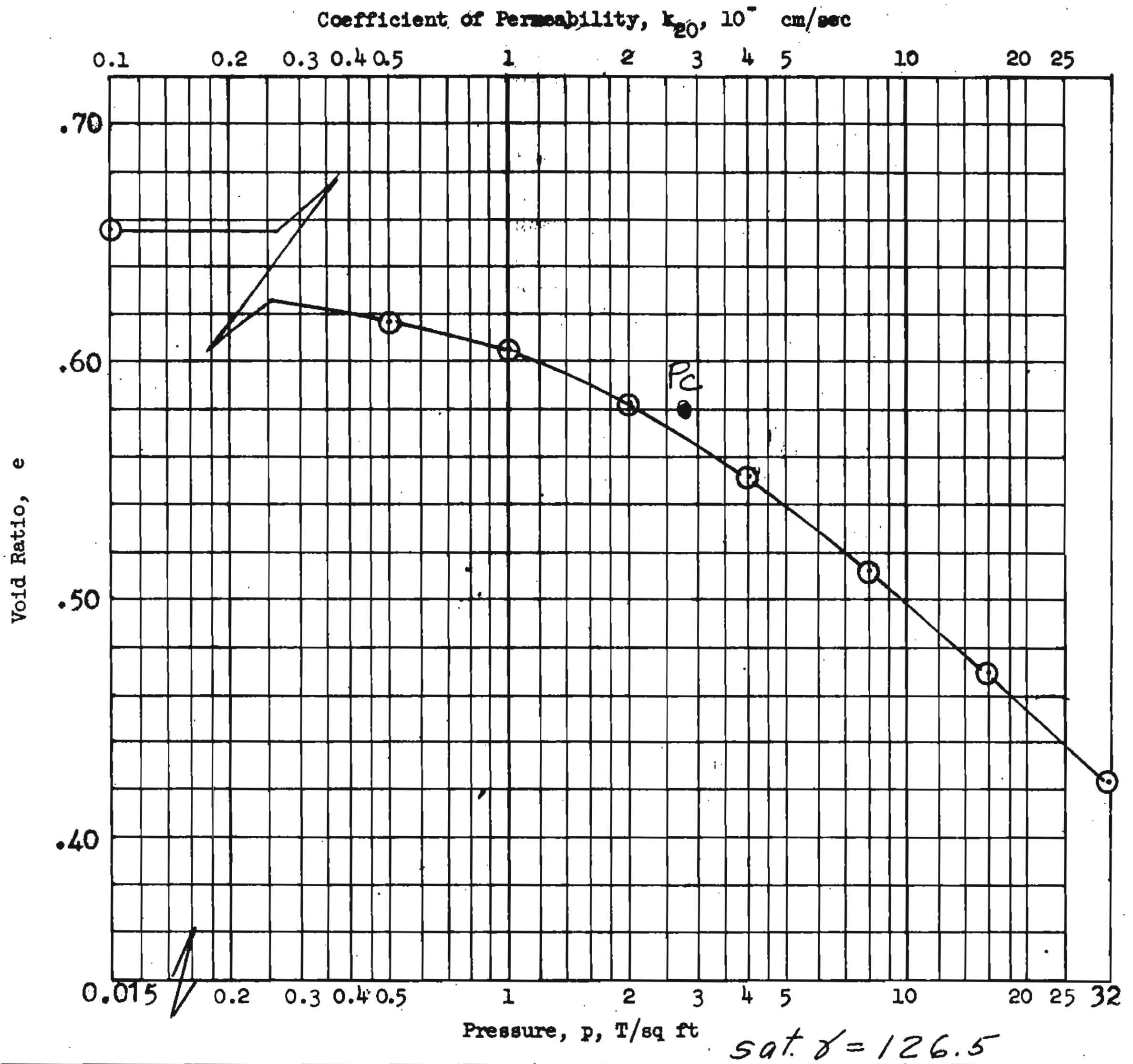
JDB **CONSOLIDATION TEST REPORT**



sat. γ = 108.6

Type of Specimen UNDISTURBED		Before Test			After Test	
Diam 4.25 in.	Ht 1.161 in.	Water Content, w_o	48.9 %	w_f		%
Overburden Pressure, p_o T/sq ft		Void Ratio, e_o	1.35	e_f		
Preconsol. Pressure, p_c 2.18 T/sq ft		Saturation, S_o	99.4 %	S_f		%
Compression Index, C_c 0.88		Dry Density, γ_d	72.8 lb/ft³			
Classification PLASTIC CLAY(CH),*		k_{20} at e_o = × 10^{-} cm/sec				
LL 75	G_s 2.74	Project LK. PONT., LA.& VIC.-HURR. PROT.-1970				
PL 25	D_{10}	ORLEANS PARISH LAKEFRONT LEVEE WEST OF IHNC				
Remarks *gray, contains small		Area GDM NO.2 SUPP. NO. 5 (OUTFALL CANALS)				
shells		Boring No. 4-OUE		Sample No. 15-B		
		~~Depth~~ El -58.6		Date 5 Nov., 1970		
		JDB CONSOLIDATION TEST REPORT				

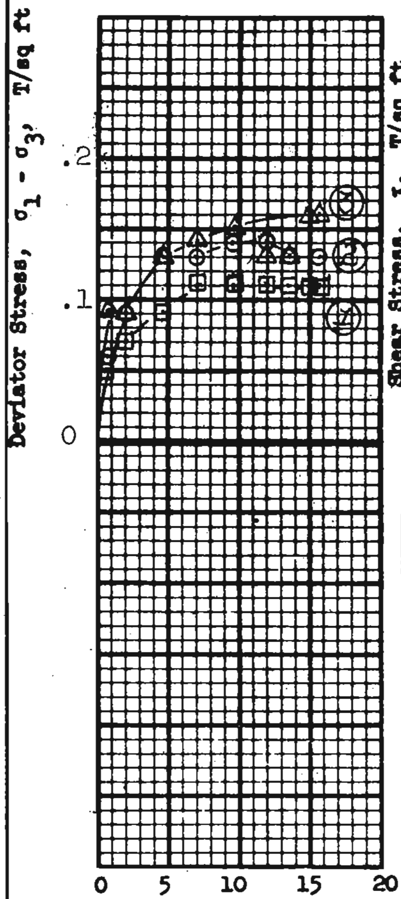
ENG FORM 1 MAY 63 2090 PREVIOUS EDITIONS ARE OBSOLETE. (TRANSLUCENT)

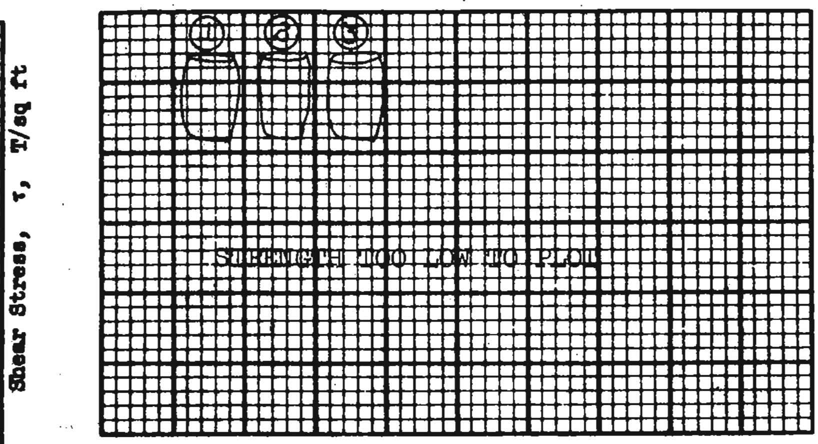


sat. γ = 126.5

Type of Specimen UNDISTURBED		Before Test		After Test	
Diam 4.25 in.	Ht 1.167 in.	Water Content, w_o	23.2 %	w_f	%
Overburden Pressure, p_o T/sq ft		Void Ratio, e_o	0.655	e_f	
Preconsol. Pressure, p_c = 2.70 T/sq ft		Saturation, S_o	95.8 %	S_f	%
Compression Index, C_c 0.159		Dry Density, γ_d	101.8 lb/ft^3		
Classification SANDY CLAY(CL),light*		k_{20} at e_o = × 10^{-} cm/sec			
LL 36	G_s 2.70	Project LK. PONT.-HURR. PROT. ORLEANS PARISH			
PL 13	D_{10}	LAKE FRONT LEVEE WEST OF IHNC GDM #2			
Remarks *gray		Area SUPP. #5 (OUTFALL CANALS)			
		Boring No. 4-OUE		Sample No. 16-D	
		~~Depth~~ El -64.0		Date 9 Nov., 1970	
		JDB CONSOLIDATION TEST REPORT			

ENG FORM 1 MAY 63 2090 PREVIOUS EDITIONS ARE OBSOLETE. (TRANSLUCENT)





sat.γ=80.4

Test No.			1	2	3	Avg.
Initial	Water content	w_o	280.0%	305.7%	313.3%	299.7%
	Void ratio	e_o	5.53	6.17	6.25	
	Saturation	S_o	86.2 %	85.7 %	86.9 %	%
	Dry density, lb/cu ft	γ_d	19.2	17.5	17.3	
Before Shear	Water content	w_c	%	%	%	%
	Void ratio	e_c				
	Saturation	S_c	%	%	%	%
	Final back pressure, T/sq ft	u_o				
Final	Water content	w_f	%	%	%	%
	Void ratio	e_f				
Minor principal stress, T/sq ft		σ_3	0.5	1.5	3.0	
Max deviator stress, T/sq ft		$(\sigma_1-\sigma_3)_{max}$	0.11	0.14	0.16	
Time to failure, min		t_f	54	75	122	
Rate of strain, percent/min			0.13	0.13	0.13	
Ult deviator stress, T/sq ft		$(\sigma_1-\sigma_3)_{ult}$				
Initial diameter, in.		D_o	1.39	1.40	1.39	
Initial height, in.		H_o	3.00	3.00	3.00	

Shear Strength Parameters

ϕ = 0 °

tan ϕ = 0

c = 0.07 T/sq ft

Method of saturation ________

☐ Controlled stress

☒ Controlled strain

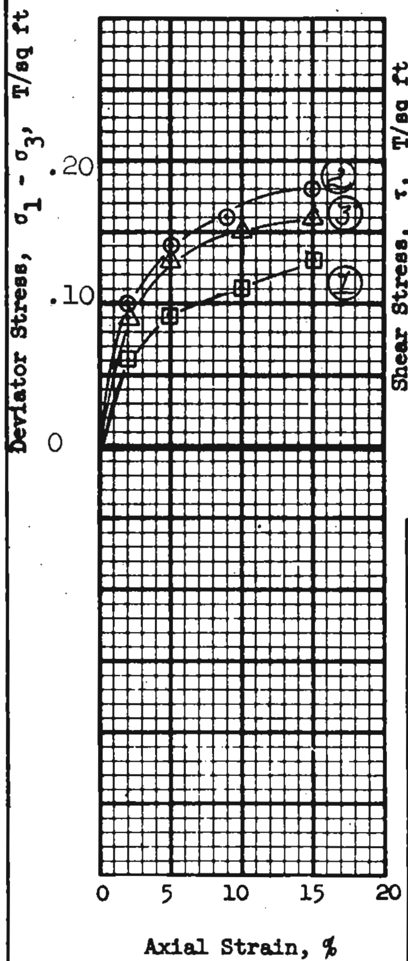
Type of test Q	Type of specimen UNDISTURBED			
Classification ORGANIC CLAY(OH), brown,				
LL –	PL –	PI –		G_s 2.01 From Consol.

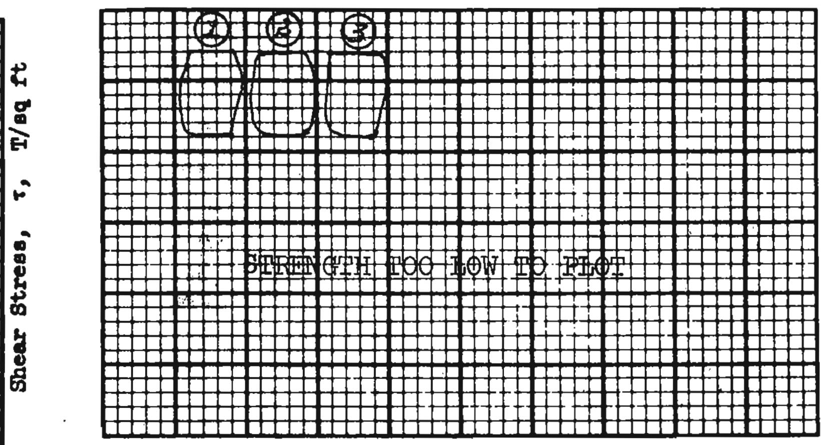
Remarks ________

Project LK. PONT., LA.&VIC.- HURR. PROT.-(70)	
ORLEANS PARISH LAKEFRONT LEVEE WEST OF IHNC;	
Area GDM NO.2, SUPP. NO.5 (OUTFALL CANALS)	
Boring No. 5-OUE	Sample No. 3-C
Depth El -10.1	Date 16 Nov. 1970
TES TRIAXIAL COMPRESSION TEST REPORT	

ENG FORM 1 JUN 65 2089 (EM 1110-2-1902) PREVIOUS EDITIONS ARE OBSOLETE TRANSLUCENT

USAEWES SOILS TEST SECTION





sat. γ = 109.9

Test No.			1	2	3	Avg.
Initial	Water content	w_o	43.7 %	45.5 %	45.1 %	44.8 %
	Void ratio	e_o	1.21	1.27	1.28	
	Saturation	S_o	97.9 %	97.1 %	95.5 %	%
	Dry density, lb/cu ft	γ_d	76.7	74.5	74.3	
Before Shear	Water content	w_c	%	%	%	%
	Void ratio	e_c				
	Saturation	S_c	%	%	%	%
	Final back pressure, T/sq ft	u_o				
Final	Water content	w_f	%	%	%	%
	Void ratio	e_f				
Minor principal stress, T/sq ft		σ_3	0.5	1.5	3.0	
Max deviator stress, T/sq ft		$(\sigma_1-\sigma_3)_{max}$	0.13	0.18	0.16	
Time to failure, min		t_f	94	57	63	
Rate of strain, percent/min			0.16	0.26	0.24	
Ult deviator stress, T/sq ft		$(\sigma_1-\sigma_3)_{ult}$				
Initial diameter, in.		D_o	1.39	1.40	1.40	
Initial height, in.		H_o	3.00	3.00	3.00	

Shear Strength Parameters

ϕ = 0 °

tan ϕ = 0

c = 0.08 T/sq ft

Method of saturation ________

[ ] Controlled stress

[x] Controlled strain

Type of test Q	Type of specimen UNDISTURBED
Classification	LEAN CLAY(CL), gray, contains numerous 1/2" dia. shells
LL 42	PL 20
PI 22	G_s 2.71

Remarks Specimens patched where shells removed

Project LK. PONT., LA.& VIC.- HURR. PROT.- 1970 ORLEANS PARISH LAKEFRONT LEVEE WEST OF IHNC

Area GDM NO.2, SUPP. NO.5 (OUTFALL CANALS)

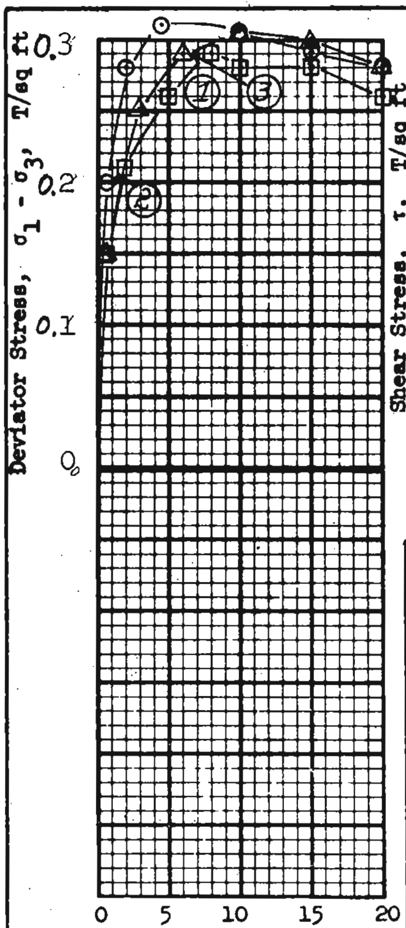
Boring No. 5-OUE | Sample No. 6-C

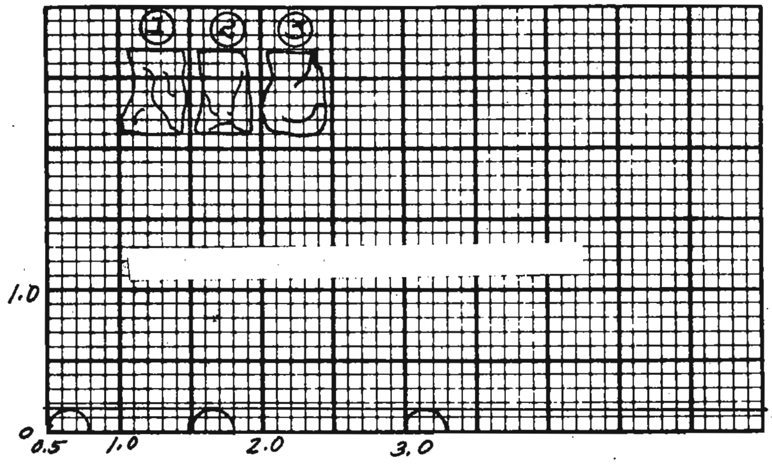
Depth El -17.7 | Date 17 Nov. 1970

JS TRIAXIAL COMPRESSION TEST REPORT

ENG FORM 1 JUN 65 2089 (EM 1110-2-1902) PREVIOUS EDITIONS ARE OBSOLETE

 ~~TRANSLUCENT~~ USAEWES SOILS TEST SECTION





sat.γ = 97.3

Test No.			1	2	3	Avg.
Initial	Water content	w_o	76.8 %	76.7 %	76.8 %	76.8 %
	Void ratio	e_o	2.14	2.13	2.14	
	Saturation	S_o	98.7 %	99.0 %	98.7 %	%
	Dry density, lb/cu ft	γ_d	54.7	54.9	54.7	
Before Shear	Water content	w_c	%	%	%	%
	Void ratio	e_c				
	Saturation	S_c	%	%	%	%
	Final back pressure, T/sq ft	u_o				
Final	Water content	w_f	%	%	%	%
	Void ratio	e_f				
Minor principal stress, T/sq ft		σ_3	0.5	1.5	3.0	
Max deviator stress, T/sq ft		$(\sigma_1-\sigma_3)_{max}$	0.29	0.32	0.31	
Time to failure, min		t_f	57	11	36	
Rate of strain, percent/min			0.14	0.42	0.28	
Ult deviator stress, T/sq ft		$(\sigma_1-\sigma_3)_{ult}$				
Initial diameter, in.		D_o	1.40	1.39	1.40	
Initial height, in.		H_o	3.00	3.00	3.00	

Shear Strength Parameters

ϕ = 0 °

tan ϕ = 0

c = 0.15 T/sq ft

Method of saturation ______

☐ Controlled stress

☒ Controlled strain

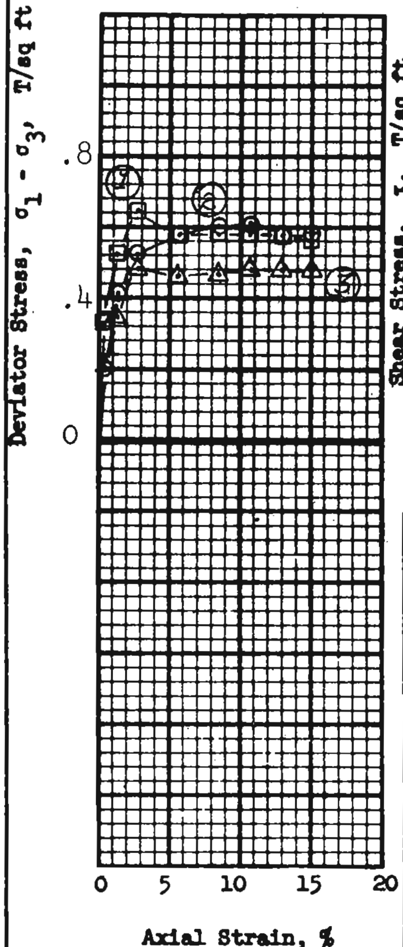
Type of test Q	Type of specimen UNDISTURBED			
Classification PLASTIC CLAY(CH),gray				
LL -	PL -	PI -		G_s 2.75 from 8B (S)

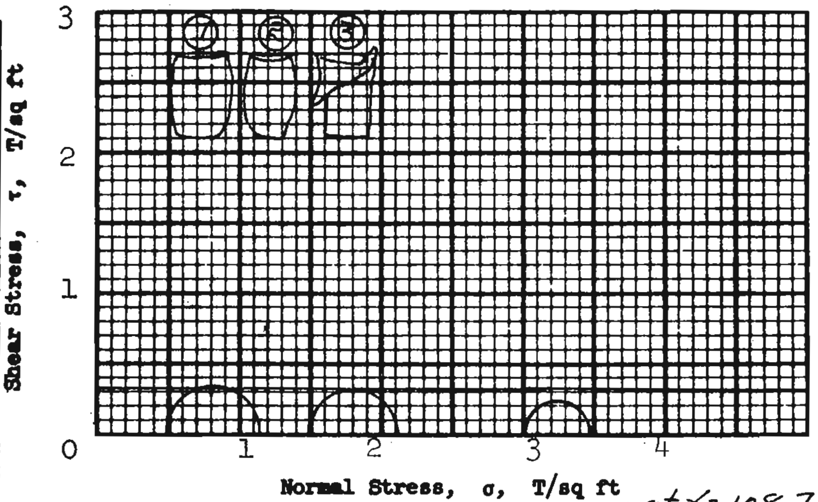
Remarks ______

Project LK. PONT.,LA.&VIC.-HURR. PROT.-1970	
ORLEANS PARISH LAKEFRONT LEVEE WEST OF IHNC;	
Area GDM NO.2;SUPP. NO.5 (OUTFALL CANALS)	
Boring No. 5-OUE	Sample No. 8-D
Depth-El -26.8	Date 17 Nov. 1970
BCH	TRIAXIAL COMPRESSION TEST REPORT

ENG FORM 1 JUN 65 2089 (EM 1110-2-1902) PREVIOUS EDITIONS ARE OBSOLETE

35 TRANSLUCENT USAEWES SOILS TEST SECTION





sat. γ = 108.7

Test No.			1	2	3	Avg.
Initial	Water content	w_o	43.3 %	42.6 %	52.0 %	46 %
	Void ratio	e_o	1.21	1.17	1.39	
	Saturation	S_o	95.5 %	97.2 %	99.9 %	%
	Dry density, lb/cu ft	γ_d	75.5	76.7	69.7	
Before Shear	Water content	w_c	%	%	%	%
	Void ratio	e_c				
	Saturation	S_c	%	%	%	%
	Final back pressure, T/sq ft	u_o				
Final	Water content	w_f	%	%	%	%
	Void ratio	e_f				
Minor principal stress, T/sq ft		σ_3	0.5	1.5	3.0	
Max deviator stress, T/sq ft		$(\sigma_1-\sigma_3)_{max}$	0.64	0.61	0.48	
Time to failure, min		t_f	21	82	21	
Rate of strain, percent/min			0.13	0.13	0.13	
Ult deviator stress, T/sq ft		$(\sigma_1-\sigma_3)_{ult}$				
Initial diameter, in.		D_o	1.40	1.40	1.40	
Initial height, in.		H_o	3.00	3.00	3.00	

Shear Strength Parameters

ϕ = 0 °

tan ϕ = 0

c = 0.31 T/sq ft

Method of saturation ________

☐ Controlled stress

☒ Controlled strain

Type of test Q | Type of specimen UNDISTURBED

Classification LEAN CLAY(CL), gray, contains scattered ~~1/8" to 1/4"~~ shells and layers of*

LL 44 | PL 20 | PI 24 | G_s 2.67

Remarks fine sand.

Project LK. PONT., LA.&VIC. - HURR. PROT. 1970

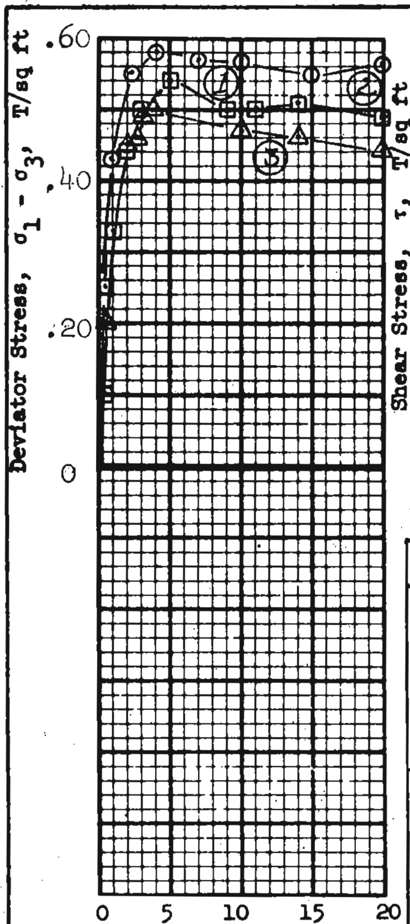
ORLEANS PARISH LAKEFRONT LEVEE WEST OF IHNC

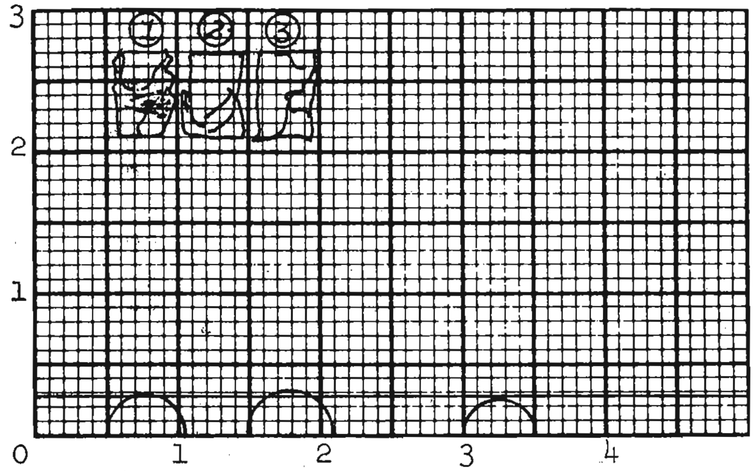
Area GDM NO.2, SUPP. NO.5 (OUTFALL CANALS)

Boring No. 5-OUE | Sample No. 13-B

Depth El -47.2 | Date 17 Nov. 1970

TES TRIAXIAL COMPRESSION TEST REPORT





sat.γ = 105.3

Shear Strength Parameters

ϕ = 0 °

tan ϕ = 0

c = 0.270 T/sq ft

Method of saturation ________

☐ Controlled stress

☒ Controlled strain

Test No.			1	2	3	Avg.
Initial	Water content	w_o	50.9 %	51.8 %	57.2 %	53.3 %
	Void ratio	e_o	1.40	1.43	1.57	
	Saturation	S_o	97.8 %	97.4 %	98.0 %	%
	Dry density, lb/cu ft	γ_d	69.9	69.2	65.4	
Before Shear	Water content	w_c	%	%	%	%
	Void ratio	e_c				
	Saturation	S_c	%	%	%	%
	Final back pressure, T/sq ft	u_o				
Final	Water content	w_f	%	%	%	%
	Void ratio	e_f				
Minor principal stress, T/sq ft		σ_3	0.5	1.5	3.0	
Max deviator stress, T/sq ft		$(\sigma_1-\sigma_3)_{max}$	0.54	0.58	0.50	
Time to failure, min		t_f	13	15	11	
Rate of strain, percent/min			0.40	0.27	0.32	
Ult deviator stress, T/sq ft		$(\sigma_1-\sigma_3)_{ult}$				
Initial diameter, in.		D_o	1.39	1.40	1.39	
Initial height, in.		H_o	3.00	3.00	3.00	

Type of test Q | Type of specimen UNDISTURBED

Classification PLASTIC CLAY(CH), gray, contains shells and sand pockets

LL - | PL - | PI - | G_s 2.69 From 14-B Consol.

Remarks ________

Project LK. PONT., LA.&VIC.-HURR. PROT.-1970

ORLEANS PARISH LAKEFRONT LEVEE WEST OF IHNC;

Area GDM NO.2;SUPP. NO.5 (OUTFALL CANALS)

Boring No. 5-OUE | Sample No. 14-C

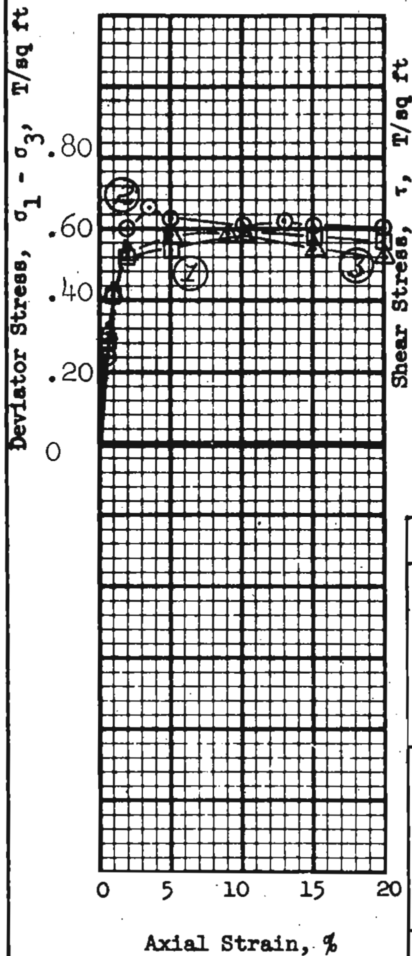
Depth El -51.9 | Date 18 Nov. 1970

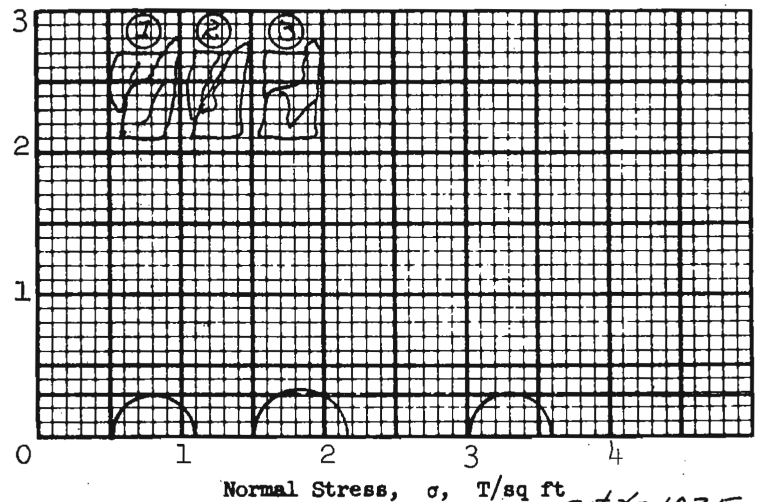
BCH TRIAXIAL COMPRESSION TEST REPORT

ENG FORM 1 JUN 65 2089 (EM 1110-2-1902) PREVIOUS EDITIONS ARE OBSOLETE

37 TRANSLUCENT

SOILS TEST SECTION





sat. γ = 103.5

Test No.			1	2	3	Avg.
Initial	Water content	w_o	57.6 %	56.1 %	61.1 %	58.3 %
	Void ratio	e_o	1.59	1.56	1.70	
	Saturation	S_o	98.5 %	97.8 %	97.8 %	%
	Dry density, lb/cu ft	γ_d	65.6	66.3	62.9	
Before Shear	Water content	w_c	%	%	%	%
	Void ratio	e_c				
	Saturation	S_c	%	%	%	%
	Final back pressure, T/sq ft	u_o				
Final	Water content	w_f	%	%	%	%
	Void ratio	e_f				
Minor principal stress, T/sq ft		σ_3	0.5	1.5	3.0	
Max deviator stress, T/sq ft		$(\sigma_1-\sigma_3)_{max}$	0.59	0.66	0.59	
Time to failure, min		t_f	58	19	75	
Rate of strain, percent/min			0.18	0.18	0.12	
Ult deviator stress, T/sq ft		$(\sigma_1-\sigma_3)_{ult}$				
Initial diameter, in.		D_o	1.42	1.42	1.41	
Initial height, in.		H_o	3.00	3.00	3.00	

Shear Strength Parameters

ϕ = 0 °

tan ϕ = 0

c = 0.295 T/sq ft

Method of saturation ________

☐ Controlled stress

☒ Controlled strain

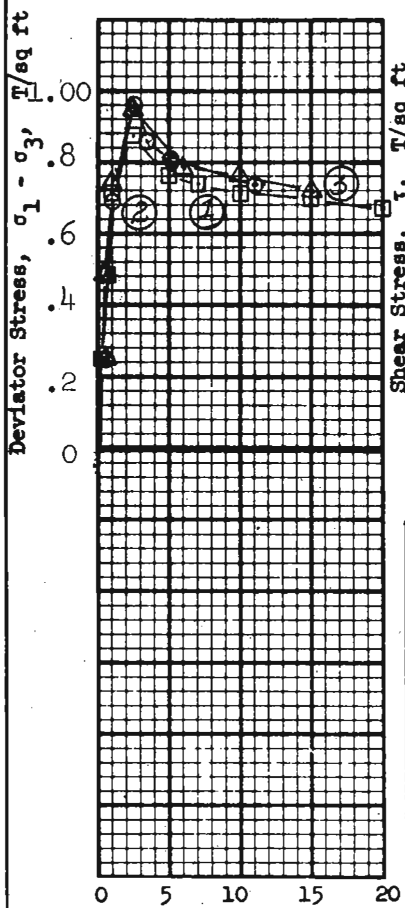
Type of test Q	Type of specimen UNDISTURBED			
Classification PLASTIC CLAY(CH),gray, contains scattered 1/16" dia. shells				
LL 80	PL 25	PI 55		G_s 2.72

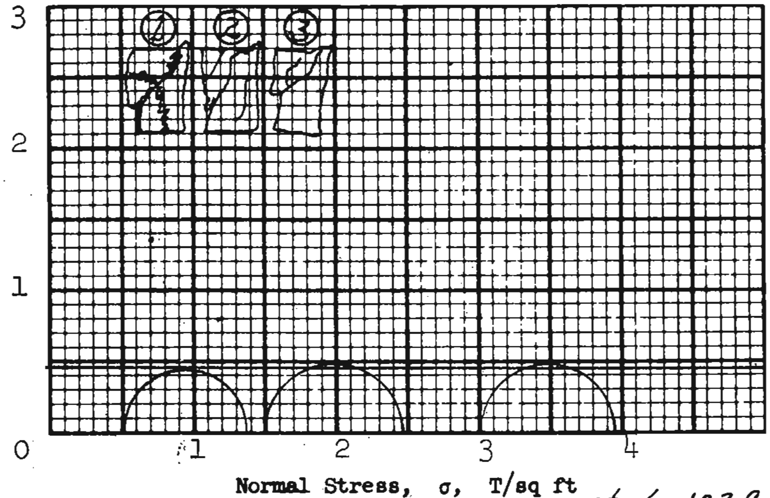
Remarks ________

Project LK. PONT.,LA. & VIC.-HURR. PROT.-1970	
ORLEANS PARISH LAKEFRONT LEVEE WEST OF IHNC;	
Area GDM NO. 2;SUPP. NO.5 (OUTFALL CANALS)	
Boring No. 5-OUE	Sample No. 16-D
Depth El -59.8	Date 18 Nov. 1970
JMS	TRIAXIAL COMPRESSION TEST REPORT

ENG FORM 1 JUN 65 2089 (EM 1110-2-1902) PREVIOUS EDITIONS ARE OBSOLETE

 TRANSLUCENT





sat. γ = 102.9

Shear Strength Parameters

ϕ = 0 °

tan ϕ = 0

c = 0.46 T/sq ft

Method of saturation ________

☐ Controlled stress

☒ Controlled strain

			Test No.	1	2	3	Avg.
Initial	Water content	w_o		59.5 %	59.9 %	58.5 %	59.3 %
	Void ratio	e_o		1.66	1.66	1.63	
	Saturation	S_o		97.5 %	98.1 %	97.6 %	%
	Dry density, lb/cu ft	γ_d		63.9	63.8	64.5	
Before Shear	Water content	w_c		%	%	%	%
	Void ratio	e_c					
	Saturation	S_c		%	%	%	%
	Final back pressure, T/sq ft	u_o					
Final	Water content	w_f		%	%	%	%
	Void ratio	e_f					
Minor principal stress, T/sq ft		σ_3		0.5	1.5	3.0	
Max deviator stress, T/sq ft		$(\sigma_1-\sigma_3)_{max}$		0.87	0.96	0.95	
Time to failure, min		t_f		14	19	33	
Rate of strain, percent/min				0.18	0.13	0.07	
Ult deviator stress, T/sq ft		$(\sigma_1-\sigma_3)_{ult}$					
Initial diameter, in.		D_o		1.41	1.41	1.41	
Initial height, in.		H_o		3.00	3.00	3.00	

Type of test Q — Type of specimen UNDISTURBED

Classification PLASTIC CLAY(CH), gray, contains 1/16" dia. shells

LL	PL	PI		G_s
91	33	58		2.72

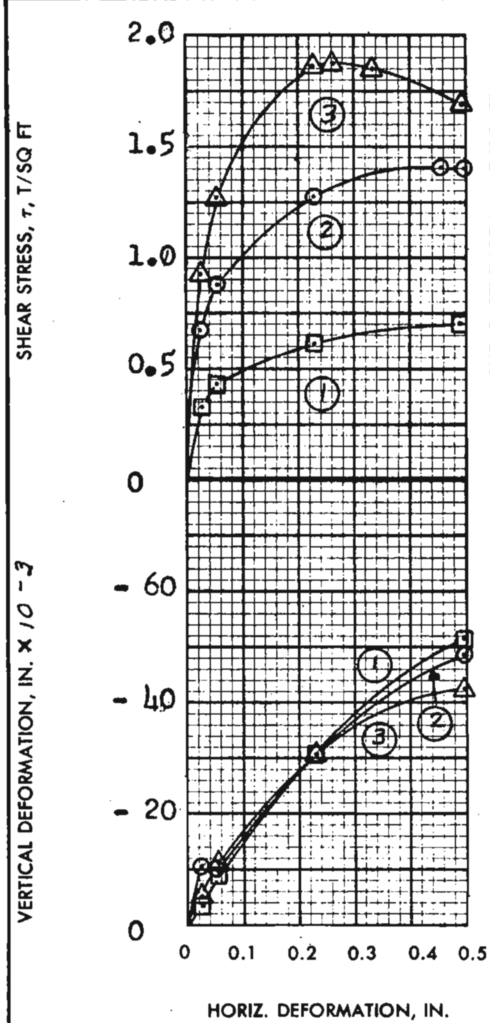
Remarks ____________

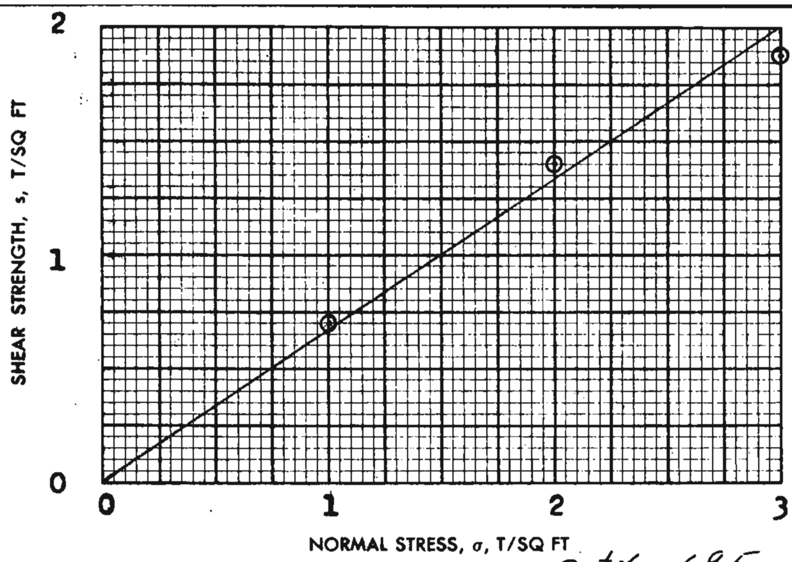
Project LK. PONT., LA. & VIC.- HURR. PROT.-1970
ORLEANS PARISH LAKEFRONT LEVEE WEST OF IHNC;
Area GDM NO.2; SUPP. NO. 5 (OUTFALL CANALS)

Boring No. 5-OUE — Sample No. 18-D

~~Depth~~ El -67.9 — Date 19 Nov. 1970

JMS — TRIAXIAL COMPRESSION TEST REPORT





sat γ = 69.5

TEST NO.			1	2	3	Avg.
INITIAL	WATER CONTENT	w_o	361.1 %	392.4 %	379.6 %	377.7 %
	VOID RATIO	e_o	6.99	7.68	7.21	
	SATURATION	S_o	99.2 %	98.1 %	100+ %	%
	DRY DENSITY, LB/CU FT	γ_d	15.0	13.8	14.6	
VOID RATIO AFTER CONSOLIDATION		e_c				
TIME FOR 50 PERCENT CONSOLIDATION, MIN		t_{50}	1	2	1	
FINAL	WATER CONTENT	w_f	227.8 %	191.8 %	126.7 %	%
	VOID RATIO	e_f				
	SATURATION	S_f	%	%	%	%
NORMAL STRESS, T/SQ FT		σ	1.0	2.0	3.0	
MAXIMUM SHEAR STRESS, T/SQ FT		τ_{max}	0.70	1.40	1.87	
ACTUAL TIME TO FAILURE, MIN		t_f	2760	2580	1500	
RATE OF STRAIN, IN./MIN			.00018	.00018	.00018	
ULTIMATE SHEAR STRESS, T/SQ FT		τ_{ult}				

SHEAR STRENGTH PARAMETERS

ϕ' = 34°

TAN ϕ' = 0.675

c' = 0 T/SQ FT

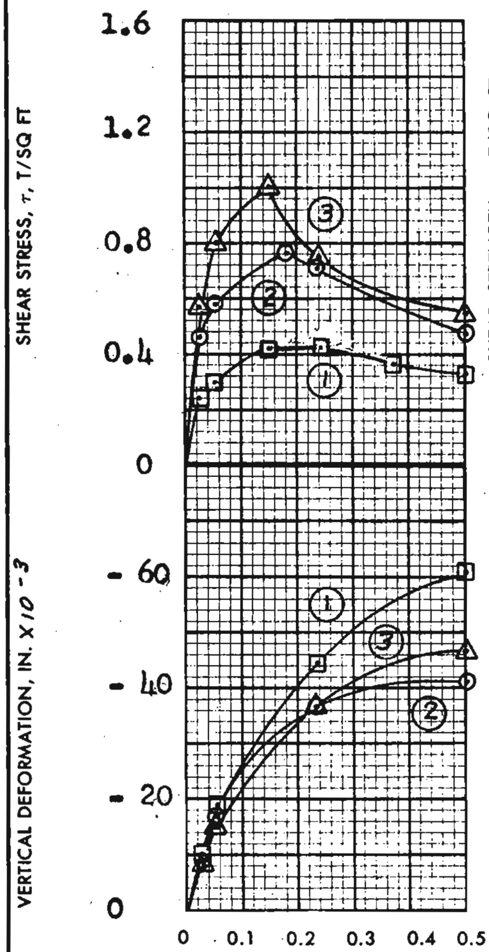
☐ CONTROLLED STRESS

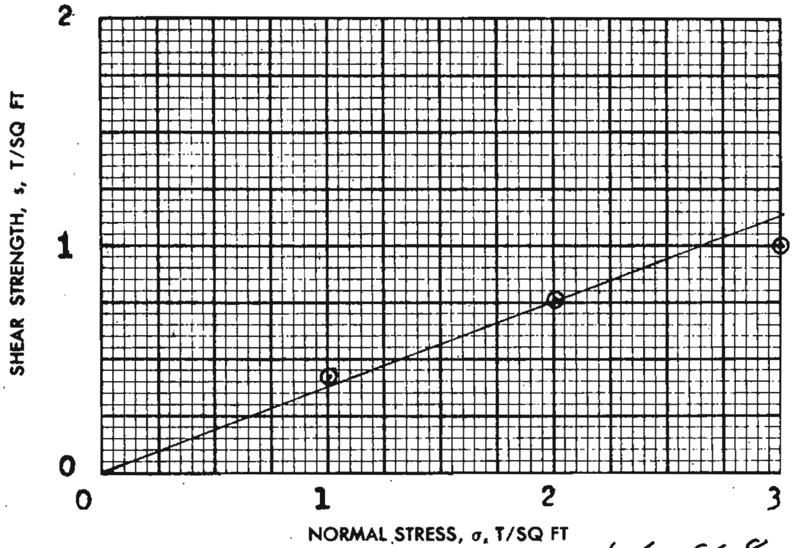
☒ CONTROLLED STRAIN

TYPE OF SPECIMEN UNDISTURBED		3.00 IN. SQUARE	0.748 IN. THICK
CLASSIFICATION ORGANIC CLAY(OH),black			
LL 209	PL 130	PI 79	G_s 1.92

REMARKS

PROJECT	LK. PONT.,LA.,& VIC.-HURR. PROT.-1970
AREA	ORLEANS PARISH LAKEFRONT LEVEE WEST OF IHNC; G.D.M. # 2, SUPP. # 5 (OUTFALL CANALS)
BORING NO. 5-OUE	SAMPLE NO. 3-B
~~DEPTH~~ EL - 9.2	DATE 1 Dec. 1970
BWG	DIRECT SHEAR TEST REPORT





sat. γ = 96.8

TEST NO.			1	2	3	Avg.
INITIAL	WATER CONTENT	w_o	76.7 %	77.4 %	78.7 %	77.6%
	VOID RATIO	e_o	2.16	2.18	2.21	
	SATURATION	S_o	97.6 %	97.6 %	97.9 %	%
	DRY DENSITY, LB/CU FT	γ_d	54.4	53.9	53.5	
VOID RATIO AFTER CONSOLIDATION		e_c				-
TIME FOR 50 PERCENT CONSOLIDATION, MIN		t_{50}	10	7	10	
FINAL	WATER CONTENT	w_f	58.4 %	49.9 %	46.3 %	%
	VOID RATIO	e_f				
	SATURATION	S_f	%	%	%	%
NORMAL STRESS, T/SQ FT		σ	1.0	2.0	3.0	
MAXIMUM SHEAR STRESS, T/SQ FT		τ_{max}	0.43	0.76	1.00	
ACTUAL TIME TO FAILURE, MIN		t_f	1350	1020	870	
RATE OF STRAIN, IN./MIN			.00019	.00019	.00019	
ULTIMATE SHEAR STRESS, T/SQ FT		τ_{ult}				

SHEAR STRENGTH PARAMETERS

ϕ' = 20°

TAN ϕ' = 0.380

c' = 0 T/SQ FT

☐ CONTROLLED STRESS

☒ CONTROLLED STRAIN

TYPE OF SPECIMEN UNDISTURBED	3.00 IN. SQUARE	1=0.560 2&3=0.625 IN. THICK	
CLASSIFICATION PLASTIC CLAY(CH), gray			
LL 98	PL 30	PI 68	G_s 2.75

REMARKS

PROJECT LK.PONT.LA.,& VIC.-HURR.PROT.-1970

ORLEANS PARISH LAKEFRONT LEVEE WEST OF IHNC;

AREA G.D.M. # 2, SUPP. # 5 (OUTFALL CANALS)

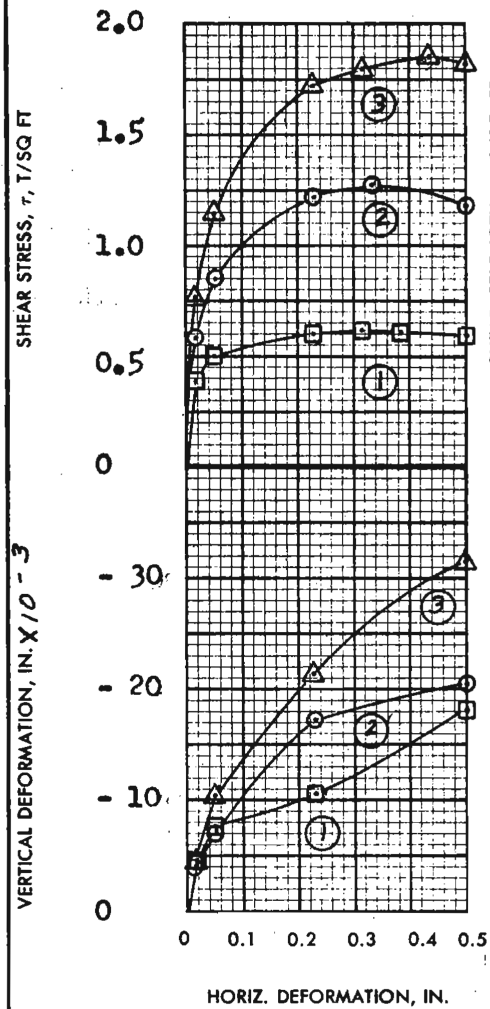
BORING NO. 5-OUE	SAMPLE NO. 8-B
~~DEPTH~~ EL - 25.0	DATE 1 Dec. 1970

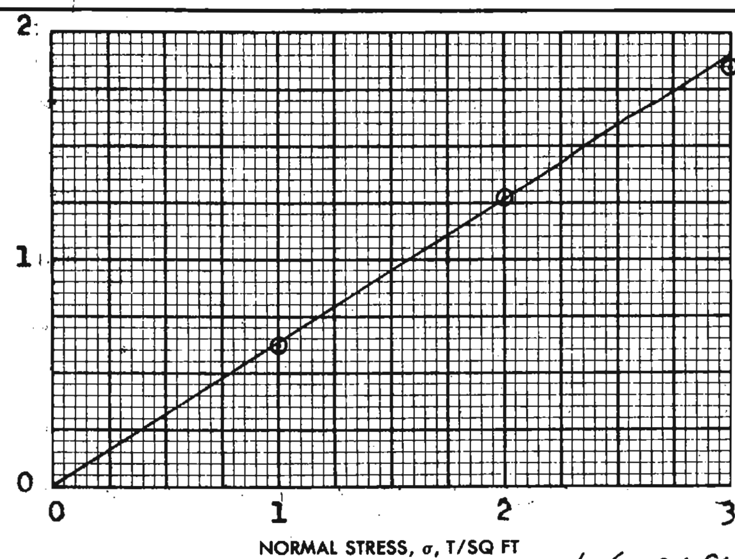
WJH

DIRECT SHEAR TEST REPORT

ENG FORM 2092 1 JUN 65 (EM 1110-2-1906) PREVIOUS EDITIONS ARE OBSOLETE (TRANSLUCENT)

4 USAEWES SOILS TEST SECTION





sat. γ = 120.8

TEST NO.			1	2	3	Avg.
INITIAL	WATER CONTENT	w_o	27.8 %	29.7 %	28.0 %	28.5 %
	VOID RATIO	e_o	0.787	0.809	0.789	
	SATURATION	S_o	94.7 %	98.4 %	95.1 %	%
	DRY DENSITY, LB/CU FT	γ_d	93.6	92.5	93.5	
VOID RATIO AFTER CONSOLIDATION		e_c				
TIME FOR 50 PERCENT CONSOLIDATION, MIN		t_{50}				
FINAL	WATER CONTENT	w_f	25.3 %	23.8 %	24.3 %	%
	VOID RATIO	e_f				
	SATURATION	S_f	%	%	%	%
NORMAL STRESS, T/SQ FT		σ	1.0	2.0	3.0	
MAXIMUM SHEAR STRESS, T/SQ FT		τ_{max}	0.62	1.27	1.85	
ACTUAL TIME TO FAILURE, MIN		t_f	1770	1890	2430	
RATE OF STRAIN, IN./MIN			.00018	.00018	.00018	
ULTIMATE SHEAR STRESS, T/SQ FT		τ_{ult}				

SHEAR STRENGTH PARAMETERS

ϕ' = 32°

TAN ϕ' = 0.635

c' = 0 T/SQ FT

☐ CONTROLLED STRESS

☒ CONTROLLED STRAIN

TYPE OF SPECIMEN	UNDISTURBED	3.00 IN. SQUARE	0.560 IN. THICK

CLASSIFICATION SILTY SAND(SM), gray, contains small balls of clay(CH) and small shells

LL -	PL -	PI -	G_s 2.68

REMARKS

PROJECT LK. PONT. LA., & VIC.-HURR. PROT.-1970

ORLEANS PARISH LAKEFRONT LEVEE WEST OF IHNC;

AREA G.D.M. # 2, SUPP. # 5(OUTFALL CANALS)

BORING NO. 5-OUE	SAMPLE NO. 9-C
~~DEPTH~~ EL - 30.1	DATE 2 Dec. 1970

WJH

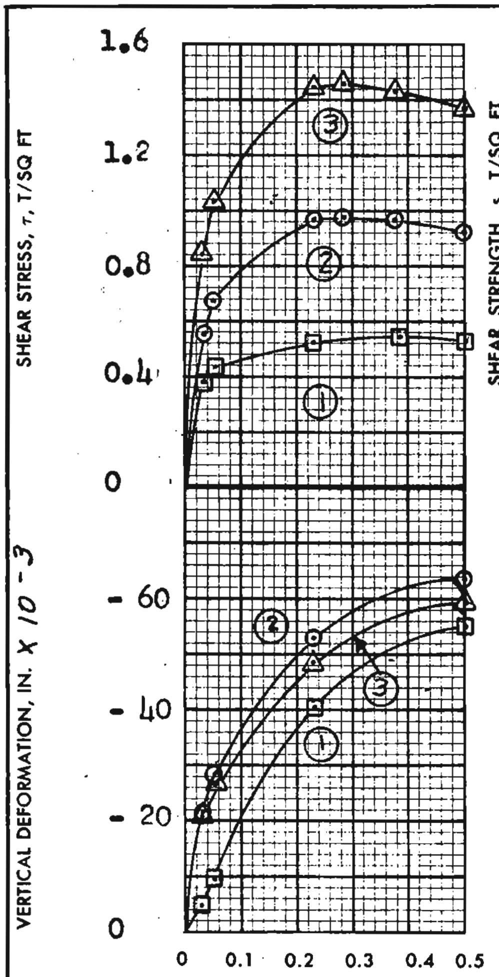
DIRECT SHEAR TEST REPORT

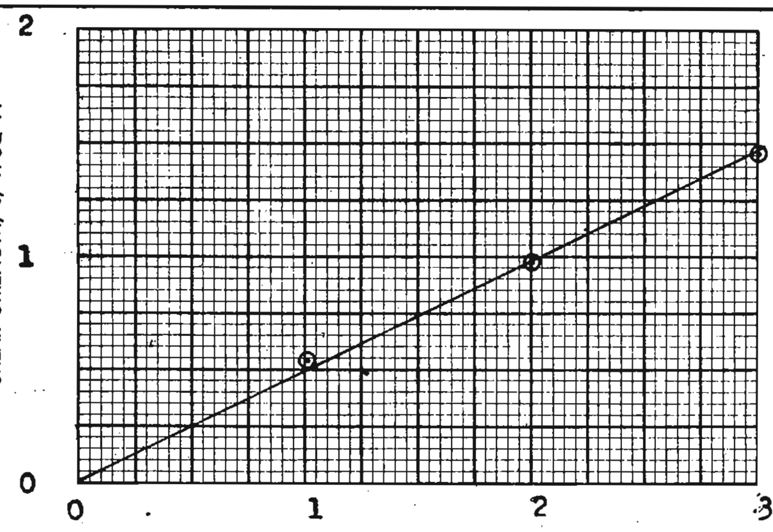
42

~~USAEWES SOILS TEST SECTION~~

PLATE IX-

ENG FORM 1 JUN 65 2092 (EM 1110-2-1906) PREVIOUS EDITIONS ARE OBSOLETE (TRANSLUCENT)





sat. γ = 103.5

TEST NO.			1	2	3	Avg.
INITIAL	WATER CONTENT	w_o	57.5 %	57.6 %	56.6 %	57.2 %
	VOID RATIO	e_o	1.57	1.60	1.58	
	SATURATION	S_o	98.9 %	97.2 %	96.7 %	%
	DRY DENSITY, LB/CU FT	γ_d	65.7	64.7	65.3	
VOID RATIO AFTER CONSOLIDATION		e_c				
TIME FOR 50 PERCENT CONSOLIDATION, MIN		t_{50}	< 1	< 1	4	
FINAL	WATER CONTENT	w_f	46.9 %	41.1 %	36.0 %	%
	VOID RATIO	e_f				
	SATURATION	S_f	%	%	%	%
NORMAL STRESS, T/SQ FT		σ	1.0	2.0	3.0	
MAXIMUM SHEAR STRESS, T/SQ FT		τ_{max}	0.54	0.98	1.46	
ACTUAL TIME TO FAILURE, MIN		t_f	2070	1560	1560	
RATE OF STRAIN, IN./MIN			.00019	.00019	.00019	
ULTIMATE SHEAR STRESS, T/SQ FT		τ_{ult}				

SHEAR STRENGTH PARAMETERS

φ' = 26°

TAN φ' = 0.490

c' = 0 T/SQ FT

☐ CONTROLLED STRESS

☒ CONTROLLED STRAIN

TYPE OF SPECIMEN UNDISTURBED 3.00 IN. SQUARE 1=0.550 2&3=0.625 IN. THICK

CLASSIFICATION PLASTIC CLAY(CH),gray, fissured

LL 71	PL 23	PI 48		G_s 2.70

REMARKS

PROJECT LK.PONT.LA.,&VIC. -HURR. PROT.- 1970

ORLEANS PARISH LAKEFRONT LEVEE, WEST OF IHNC

AREA G.D.M. # 2, SUPP. # 5 (OUTFALL CANALS)

BORING NO. 5-OUE SAMPLE NO. 15-B

~~DEPTH~~ EL - 53.8 DATE 2 Dec. 1970

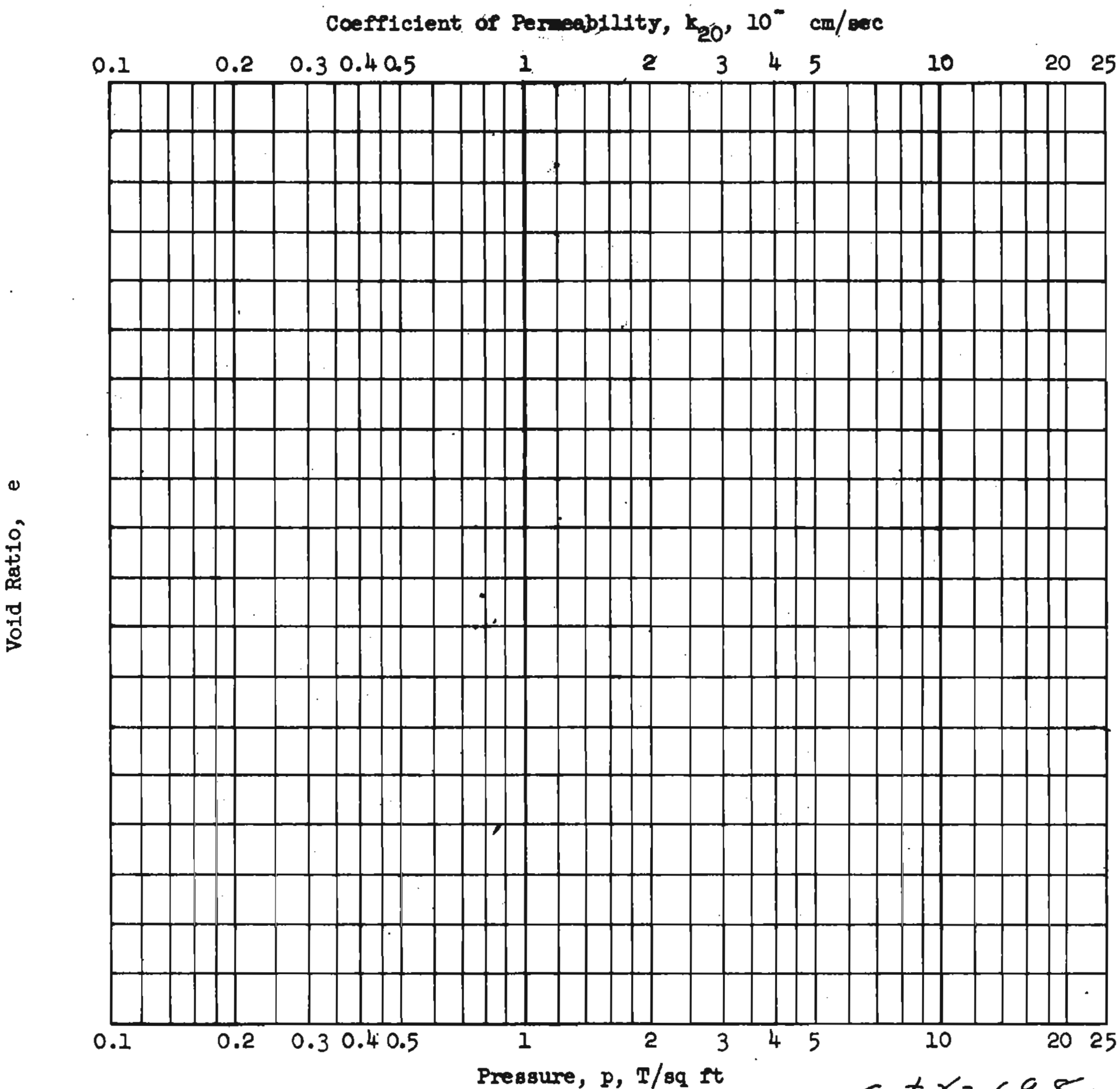
BWG

DIRECT SHEAR TEST REPORT

USAEWES SOILS TEST SECTION

43

ENG FORM 1 JUN 65 2092 (EM 1110-2-1906) PREVIOUS EDITIONS ARE OBSOLETE (TRANSLUCENT) GPO : 1966 OF—214-945



sat. γ = 69.8

Type of Specimen UNDISTURBED		Before Test		After Test	
Diam 4.25 in.	Ht 1.172 in.	Water Content, w_o	360.3 %	w_f	%
Overburden Pressure, p_o T/sq ft		Void Ratio, e_o	6.53	e_f	
Preconsol. Pressure, p_c 0.21 T/sq ft		Saturation, S_o	96.2 %	S_f	%
Compression Index, C_c 3.19		Dry Density, γ_d	14.7 lb/ft^3		
Classification ORGANIC CLAY(OH),*		k_{20} at e_o = × 10^{-} cm/sec			

LL 367	G_s 2.01
PL 128	D_{10}

Remarks See attached plot of Pressure vs. Void Ratio Curve

*brown,

Project LK. PONT. LA., & VIC.-HURR. PROT.-1970

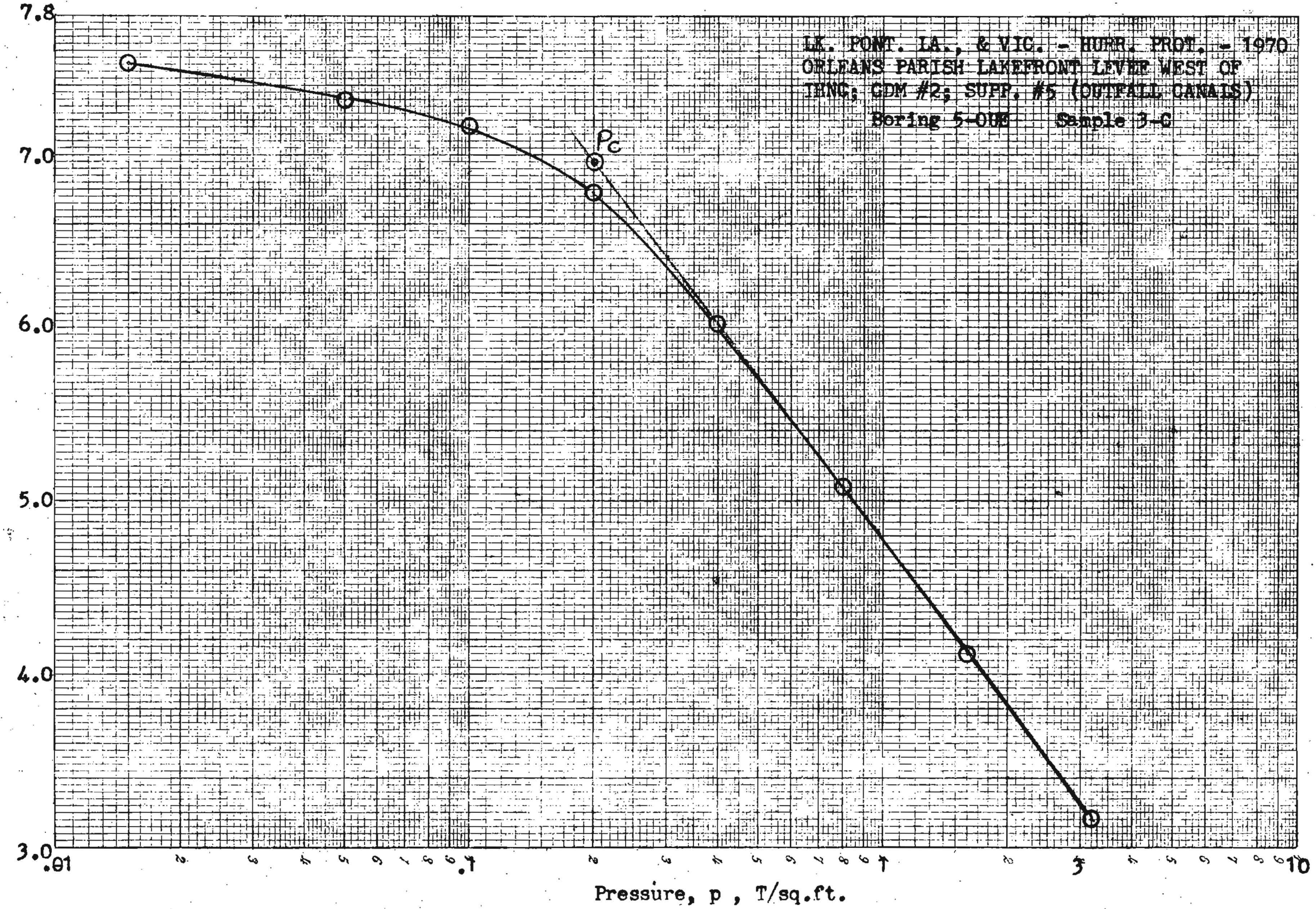
ORLEANS PARISH LAKEFRONT LEVEE WEST OF IHNC;

Area GDM #2; SUPP. #5 (OUTFALL CANALS)

Boring No. 5-OUE	Sample No. 3-C
~~Depth~~ El -10.1	Date 16 Nov., 1970

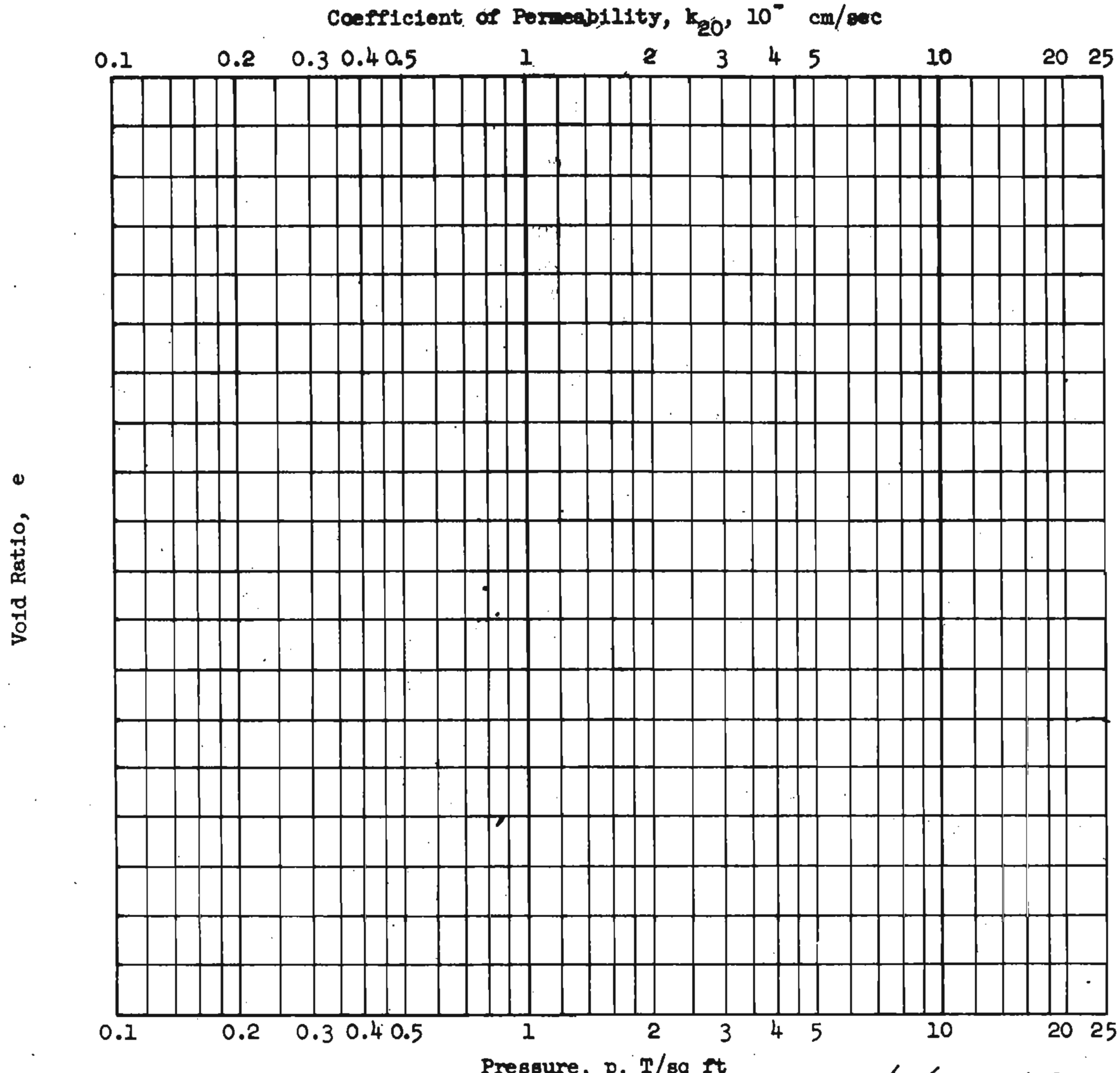
JDB **CONSOLIDATION TEST REPORT**

ENG FORM 1 MAY 63 2090 PREVIOUS EDITIONS ARE OBSOLETE. *(TRANSLUCENT)* 0 3424



45

SOILS TEST SECTION

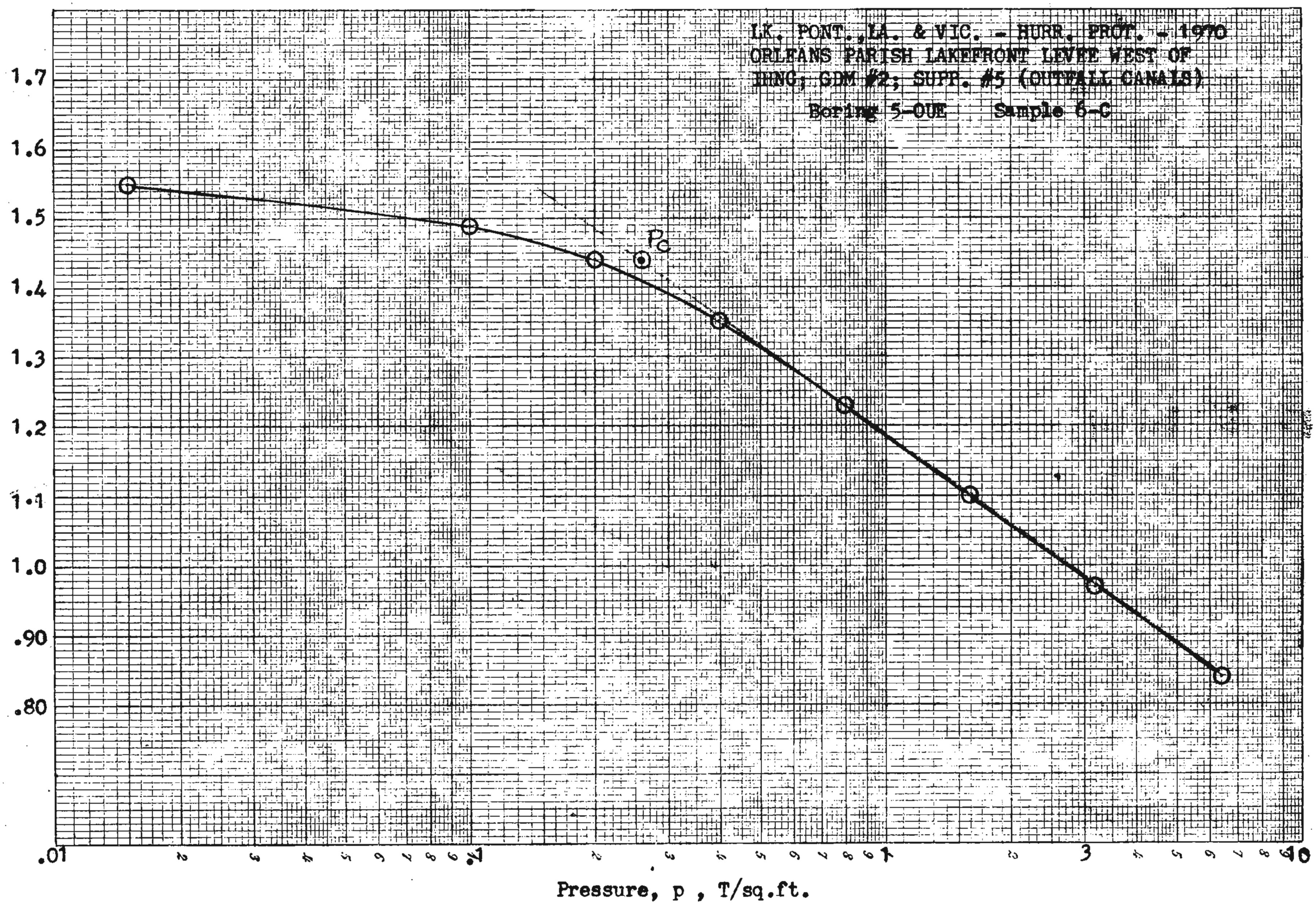


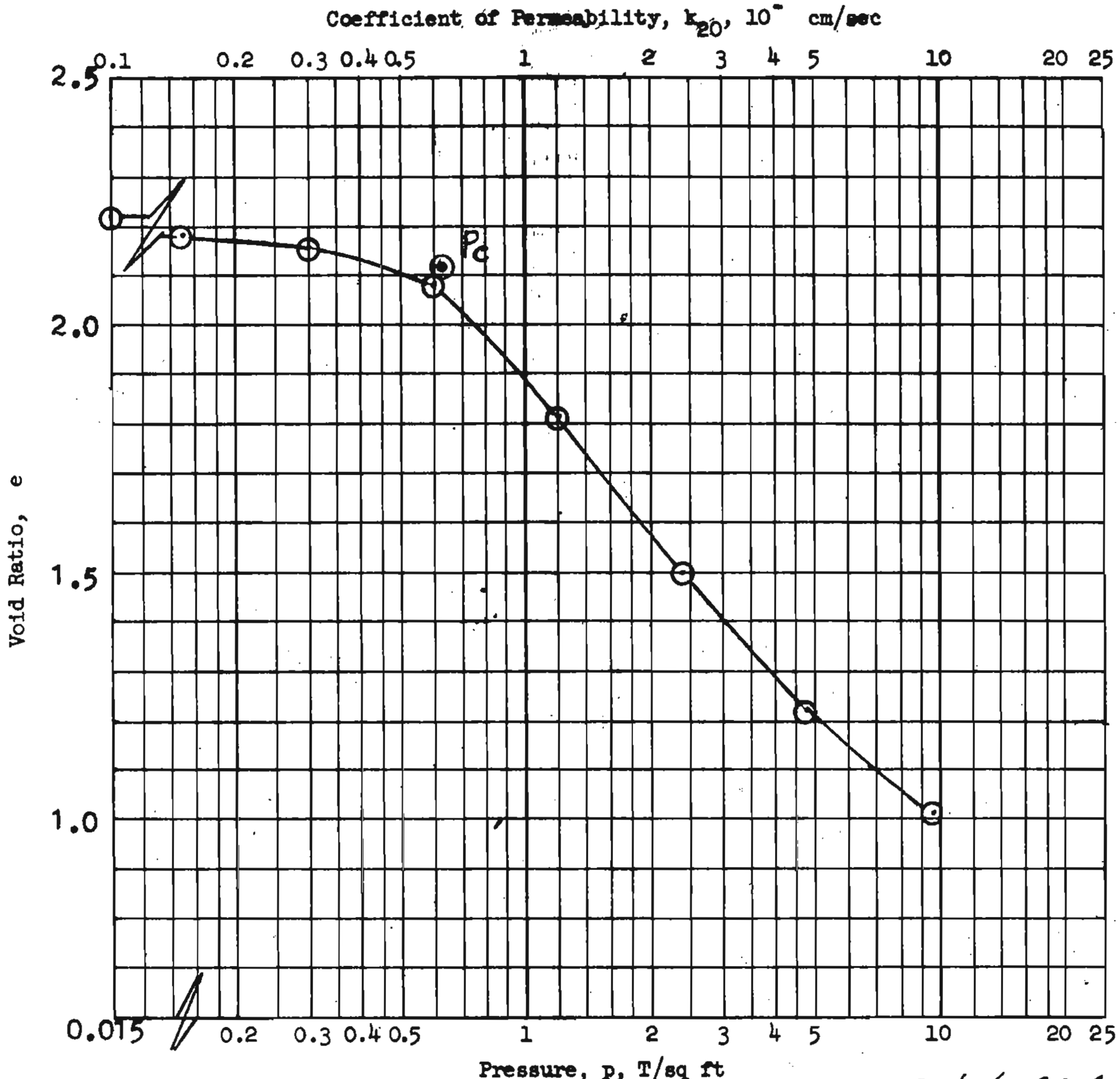
sat. γ = 104.3

Type of Specimen UNDISTURBED		Before Test		After Test
Diam 4.25 in.	Ht 1.164 in.	Water Content, w_o	55.4 %	w_f %
Overburden Pressure, p_o T/sq ft		Void Ratio, e_o	1.55	e_f
Preconsol. Pressure, p_c 0.26 T/sq ft		Saturation, S_o	97.0 %	S_f %
Compression Index, C_c = 0.43		Dry Density, γ_d	66.4 lb/ft^3	
Classification LEAN CLAY(CL), gray*		k_{20} at e_o = × 10^{-} cm/sec		
LL -	G_s 2.71 From Q	Project LK. PONT., LA., & VIC.-HURR. PROT. 1970		
PL -	D_{10}	ORLEANS PARISH LAKEFRONT LEVEE WEST OF IHNC;		
Remarks See attached plot for		Area GDM #2; SUPP. #5 (OUTFALL CANALS)		
Pressure vs Void Ratio Curve		Boring No. 5-OUE	Sample No. 6-C	
		~~Depth~~ El -17.7	Date 18 Nov., 1970	
*contains shells		CONSOLIDATION TEST REPORT		

ENG FORM 1 MAY 63 2090 PREVIOUS EDITIONS ARE OBSOLETE. (TRANSLUCENT) G 3424

46 USAEWES SOILS TEST SECTION

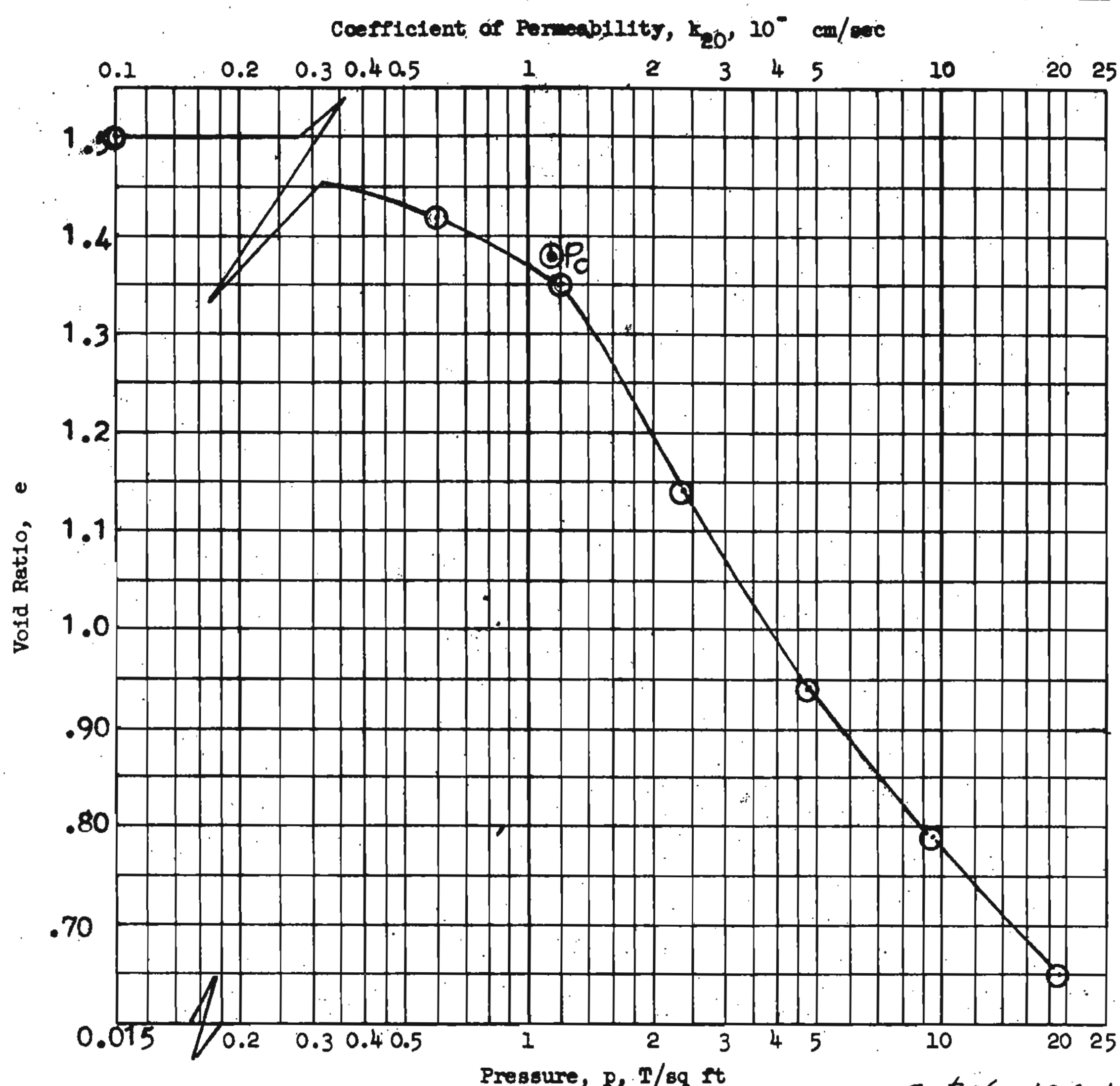

LK. PONT., LA. & VIC. - HURR. PROT. - 1970
ORLEANS PARISH LAKEFRONT LEVEE WEST OF
IHNC; GDM #2; SUPP. #5 (OUTFALL CANALS)
Boring 5-OUE Sample 6-C
Pc
Void Ratio, e
1.7
1.6
1.5
1.4
1.3
1.2
1.1
1.0
.90
.80
.01
.1
1
3
10
Pressure, p , T/sq.ft.



Sat. γ = 96.4

Type of Specimen UNDISTURBED		Before Test		After Test
Diam 4.25 in.	Ht 1.161 in.	Water Content, w_o	80.2 %	w_f %
Overburden Pressure, p_o T/sq ft		Void Ratio, e_o	2.22	e_f
Preconsol. Pressure, p_c 0.62 T/sq ft		Saturation, S_o	99.6 %	S_f %
Compression Index, C_c 1.03		Dry Density, γ_d	53.4 lb/ft^3	
Classification PLASTIC CLAY(CH),*		k_{20} at e_o = × 10^{-} cm/sec		
LL -	G_s 2.75 From 8-B(S)	Project LK. PONT., LA. & VIC.-HURR. PROT-1970		
PL -	D_{10}	ORLEANS PARISH LAKEFRONT LEVEE WEST OF IHNC;		
Remarks *gray, contains shells		Area GDM #2; SUPP. #5 (OUTFALL CANALS)		
		Boring No. 5-OUE	Sample No. 8-D	
		~~Depth~~ El -26.8	Date 18 Nov.,1970	
		JDB CONSOLIDATION TEST REPORT		

ENG FORM 1 MAY 63 2090 PREVIOUS EDITIONS ARE OBSOLETE. (TRANSLUCENT) 0 3424



sat. γ = 104.1

Type of Specimen UNDISTURBED		Before Test		After Test	
Diam 4.25 in.	Ht 1.155 in.	Water Content, w_o	55.9 %	w_f	%
Overburden Pressure, p_o T/sq ft		Void Ratio, e_o	1.50	e_f	
Preconsol. Pressure, p_c 1.05 T/sq ft		Saturation, S_o	99.7 %	S_f	%
Compression Index, C_c 0.66		Dry Density, γ_d	66.7 lb/ft^3		
Classification LEAN CLAY(CL), gray*		k_{20} at e_o = × 10^{-} cm/sec			
LL -	G_s 2.67 From Q				
PL -	D_{10}				

Remarks *contains shells

Project LA. PONT. LA., & VIC. - HURR. PROT. 1970, ORLEANS PARISH LAKEFRONT LEVEE WEST

Area OF IHNC; GDM #2; SUPP. #5 (OUTFALL CANALS)

Boring No. 5-OUE — Sample No. 13-B

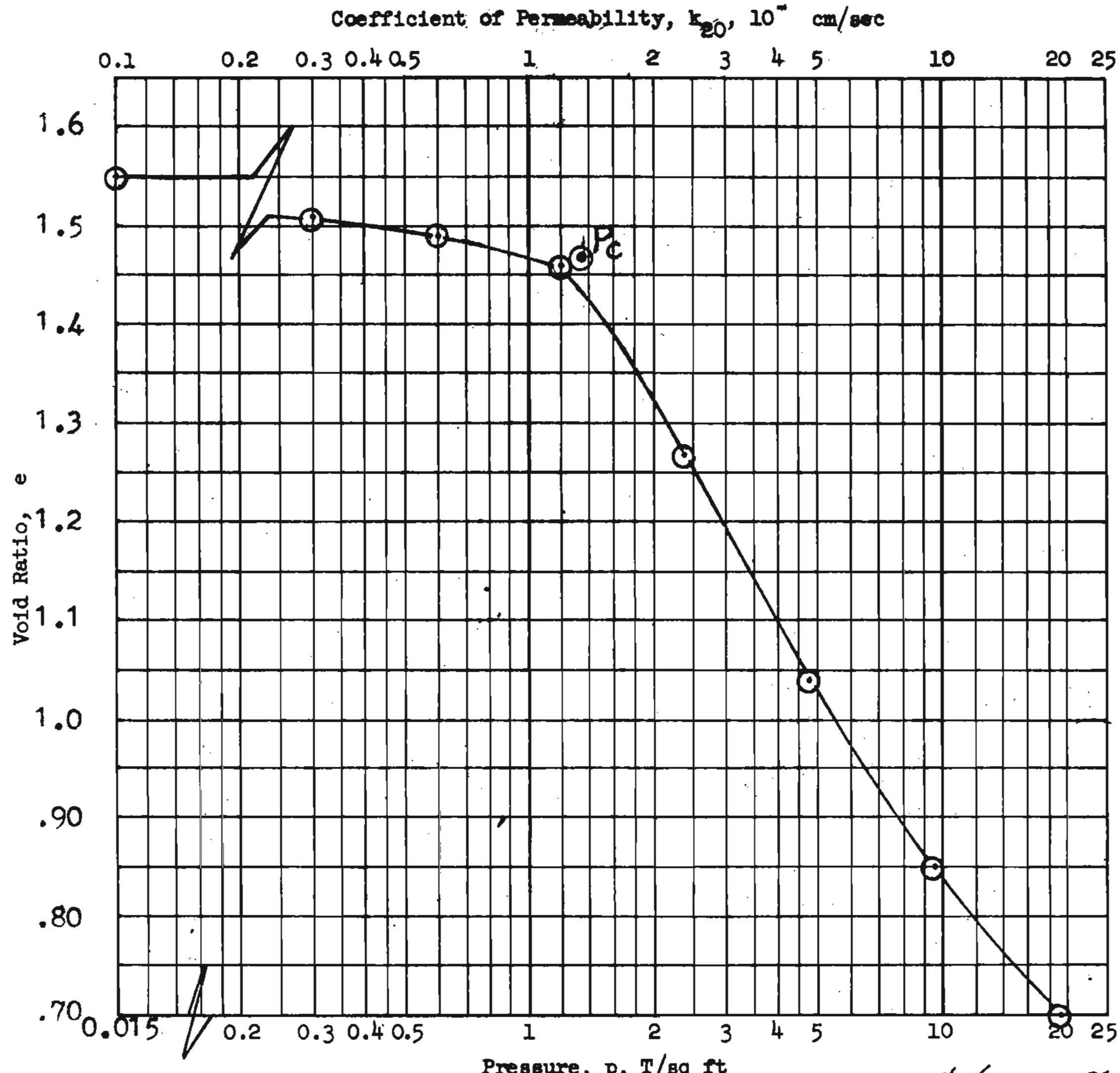
~~Depth~~ El -47.2 — Date 18 Nov., 1970

JDB **CONSOLIDATION TEST REPORT**

ENG FORM 2090, 1 MAY 63 — PREVIOUS EDITIONS ARE OBSOLETE. (TRANSLUCENT)

G 3424

USAEWES SOILS TEST SECTION



sat. γ = 103.8

Type of Specimen UNDISTURBED		Before Test		After Test	
Diam 4.25 in.	Ht 1.162 in.	Water Content, w_o	57.0 %	w_f	%
Overburden Pressure, p_o T/sq ft		Void Ratio, e_o	1.55	e_f	
Preconsol. Pressure, p_c 1.36 T/sq ft		Saturation, S_o	98.8 %	S_f	%
Compression Index, C_c 0.98		Dry Density, γ_d	65.8 lb/ft³		
Classification PLASTIC CLAY(CH),*		k_{20} at e_o =	× 10^{-} cm/sec		

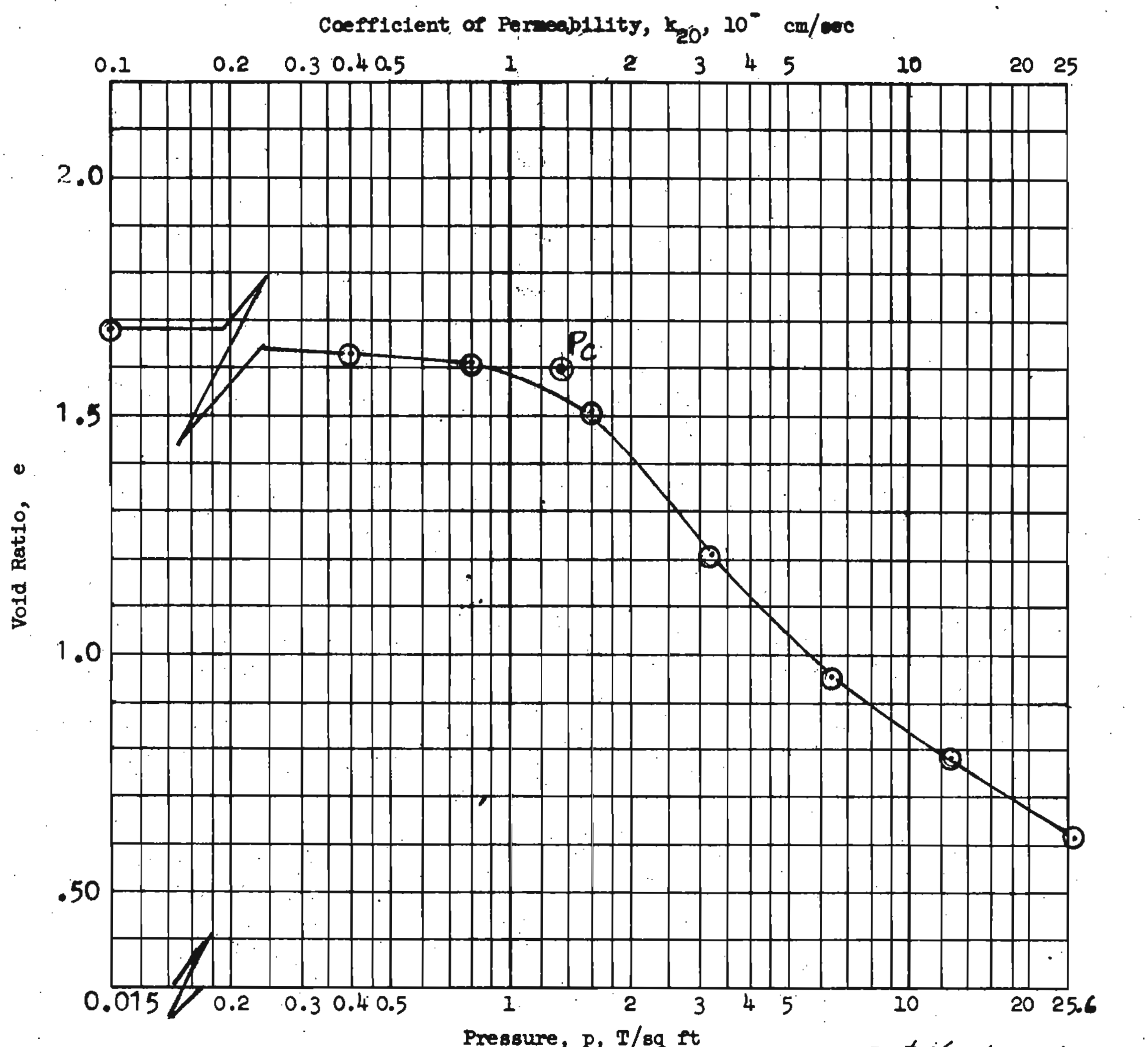
LL 77	G_s 2.69
PL 28	D_{10}

Remarks *olive green, contains small shells, 1/8" roots, and fine sand

Project LK. PONT., LA., & VIC.-HURR. PROT.-1970	
ORLEANS PARISH LAKEFRONT LEVEE WEST OF IHNC	
Area GDM #2, SUPP. #5 (OUTFALL CANALS)	
Boring No. 5-OUE	Sample No. 14-B
El -51.0	Date 23 Nov., 1970

JDB **CONSOLIDATION TEST REPORT**

ENG FORM 1 MAY 63 2090 PREVIOUS EDITIONS ARE OBSOLETE. *(TRANSLUCENT)*



sat. γ = 100.1

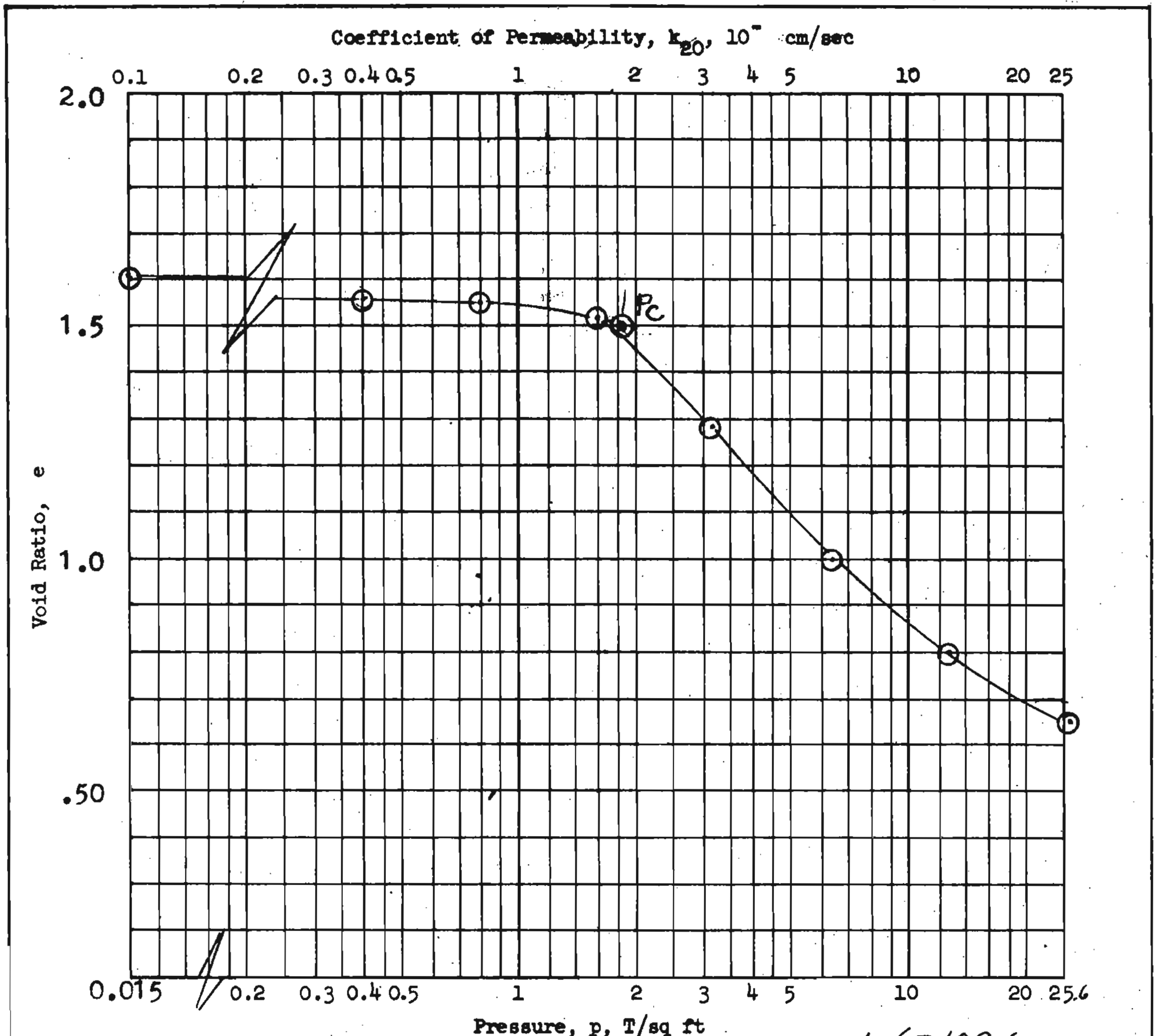
Type of Specimen UNDISTURBED		Before Test		After Test	
Diam 4.25 in.	Ht 1.162 in.	Water Content, w_o	57.0 %	w_f	%
Overburden Pressure, p_o T/sq ft		Void Ratio, e_o	1.67	e_f	
Preconsol. Pressure, p_c 1.37 T/sq ft		Saturation, S_o	98.8 %	S_f	%
Compression Index, C_c 1.00		Dry Density, γ_d	63.5 lb/ft^3		
Classification PLASTIC CLAY(CH),gray		k_{20} at e_o = × 10⁻ cm/sec			

LL -	G_s 2.72 From Q
PL -	D_{10}
Remarks	

Project LK. PONT.,LA.&VIC.-HURR. PROT.-1970	
ORLEANS PARISH LAKEFRONT LEVEE WEST OF IHNC	
Area GDM #2, SUPP. #5 (OUTFALL CANALS)	
Boring No. 5-OUE	Sample No. 16-D
~~Depth~~ El -59.8	Date 23 Nov.,1970

JDB **CONSOLIDATION TEST REPORT**

ENG FORM 1 MAY 63 2090 PREVIOUS EDITIONS ARE OBSOLETE. *(TRANSLUCENT)*



Sat. γ = 103.6

Type of Specimen UNDISTURBED		Before Test		After Test	
Diam 4.25 in.	Ht 1.162 in.	Water Content, w_o	59.2 %	w_f	%
Overburden Pressure, p_o T/sq ft		Void Ratio, e_o	1.61	e_f	
Preconsol. Pressure, p_c 1.82 T/sq ft		Saturation, S_o	100+ %	S_f	%
Compression Index, C_c 1.00		Dry Density, γ_d	65.1 lb/ft³		
Classification PLASTIC CLAY(CH),*		k_{20} at e_o =	× 10^{-} cm/sec		

LL -	G_s 2.72 From Q
PL -	D_{10}

Remarks *gray, contains 1/2" dia. shells

Project LK. PONT., LA. &VIC.-HURR. PROT.-1970

ORLEANS PARISH LAKEFRONT LEVEE WEST OF IHNC;

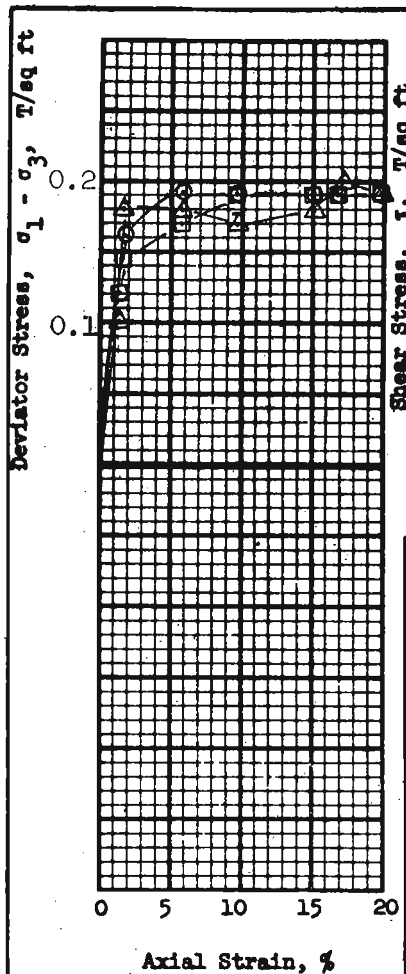
Area GDM #2; SUPP #5 (OUTFALL CANALS)

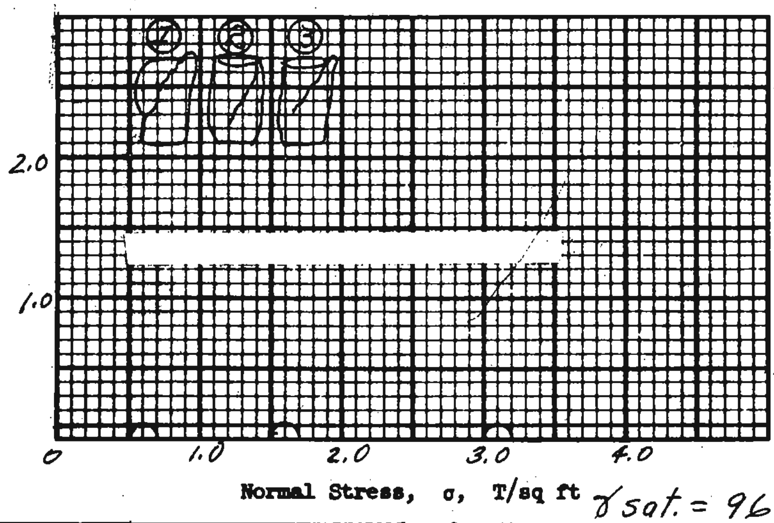
Boring No. 5-OUE	Sample No. 18-D
~~Depth~~ El -67.9	Date 1 December, 1970

JDB **CONSOLIDATION TEST REPORT**

ENG FORM 2090 1 MAY 63 PREVIOUS EDITIONS ARE OBSOLETE. *(TRANSLUCENT)* 0 3424

 USAEWES SOILS TEST SECTION





$\gamma sat. = 96$

			1	2	3	Avg.
Test No.			1	2	3	Avg.
Initial	Water content	w_o	76.1 %	81.1 %	81.8%	79.7%
	Void ratio	e_o	2.04	2.22	2.25	
	Saturation	S_o	100+ %	98.6 %	98.2 %	%
	Dry density, lb/cu ft	γ_d	55.5	52.4	51.9	
Before Shear	Water content	w_c	%	%	%	%
	Void ratio	e_c				
	Saturation	S_c	%	%	%	%
	Final back pressure, T/sq ft	u_o				
Final	Water content	w_f	%	%	%	%
	Void ratio	e_f				
Minor principal stress, T/sq ft		σ_3	0.5	1.5	3.0	
Max deviator stress, T/sq ft		$(\sigma_1-\sigma_3)_{max}$	0.19	0.19	0.20	
Time to failure, min		t_f	75	37	128	
Rate of strain, percent/min			0.13	0.13	0.13	
Ult deviator stress, T/sq ft		$(\sigma_1-\sigma_3)_{ult}$				
Initial diameter, in.		D_o	1.40	1.40	1.40	
Initial height, in.		H_o	3.00	3.00	3.00	

Shear Strength Parameters

ϕ = 0°

tan ϕ = 0

c = .09 T/sq ft

Method of saturation ______

☐ Controlled stress

☒ Controlled strain

Type of test Q	Type of specimen UNDISTURBED			
Classification PLASTIC CLAY(CH), gray, contains numerous shell fragments				
LL 93	PL 29	PI 64		G_s 2.70

Remarks ______

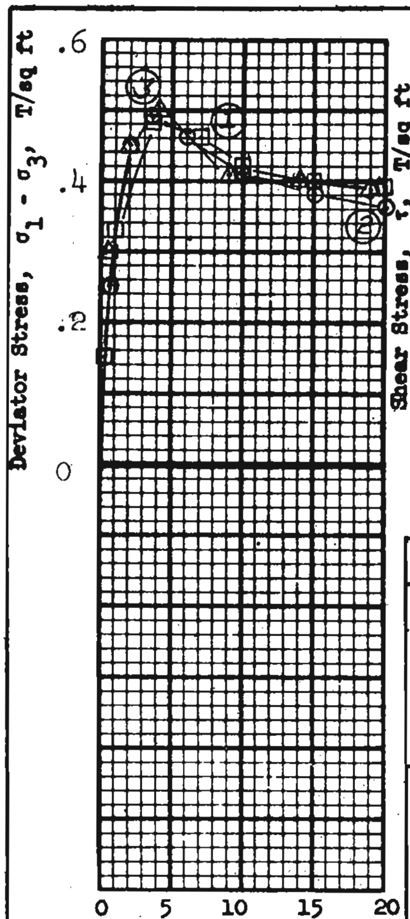
Project LK. PONT. LA.&VIC-HURR. PROT. (70)
ORLEANS PARISH LAKEFRONT LEVEE WEST OF IHNC

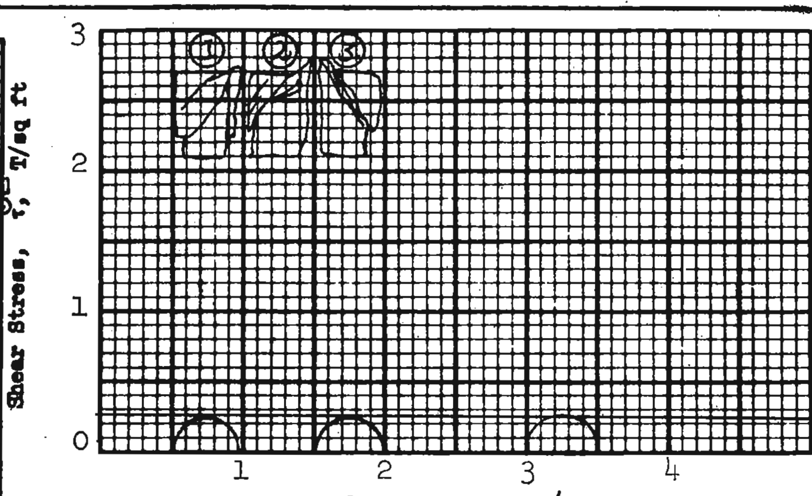
Area GDM NO.2 SUPP NO.5 (OUTFALL CANALS)

Boring No. 6-OUW | Sample No. 3-C

~~Depth~~ El -4.4 | Date 30 Nov. 1970

TES **TRIAXIAL COMPRESSION TEST REPORT**





$\gamma sat. = 100$

Test No.			1	2	3	Avg.
Initial	Water content	w_o	70.2 %	70.0 %	59.4 %	66.5 %
	Void ratio	e_o	192	1.90	1.93	
	Saturation	S_o	99.8 %	100+ %	84.0%	%
	Dry density, lb/cu ft	γ_d	58.3	58.7	58.2	
Before Shear	Water content	w_c	%	%	%	%
	Void ratio	e_c				
	Saturation	S_c	%	%	%	%
	Final back pressure, T/sq ft	u_o				
Final	Water content	w_f	%	%	%	%
	Void ratio	e_f				
Minor principal stress, T/sq ft		σ_3	0.5	1.5	3.0	
Max deviator stress, T/sq ft		$(\sigma_1-\sigma_3)_{max}$	0.48	0.49	0.50	
Time to failure, min		t_f	18	14	14	
Rate of strain, percent/min			0.19	0.25	0.28	
Ult deviator stress, T/sq ft		$(\sigma_1-\sigma_3)_{ult}$				
Initial diameter, in.		D_o	1.41	1.40	1.40	
Initial height, in.		H_o	3.00	3.00	3.00	

Shear Strength Parameters

ϕ = 0°

tan ϕ = 0

c = .245 T/sq ft

Method of saturation ______

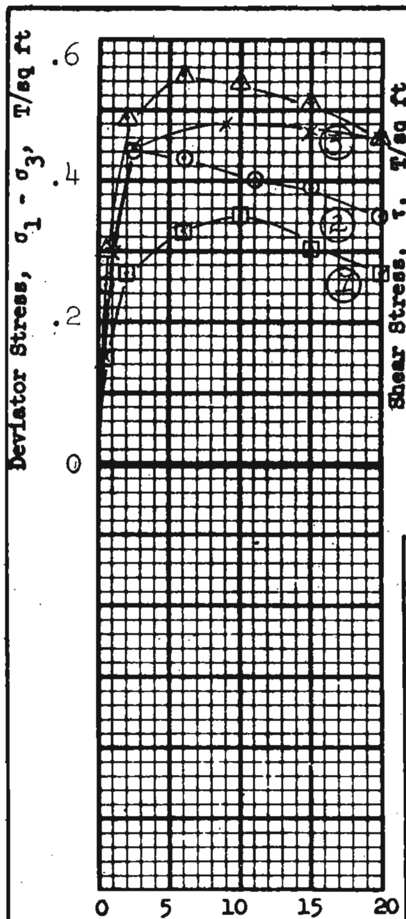
☐ Controlled stress

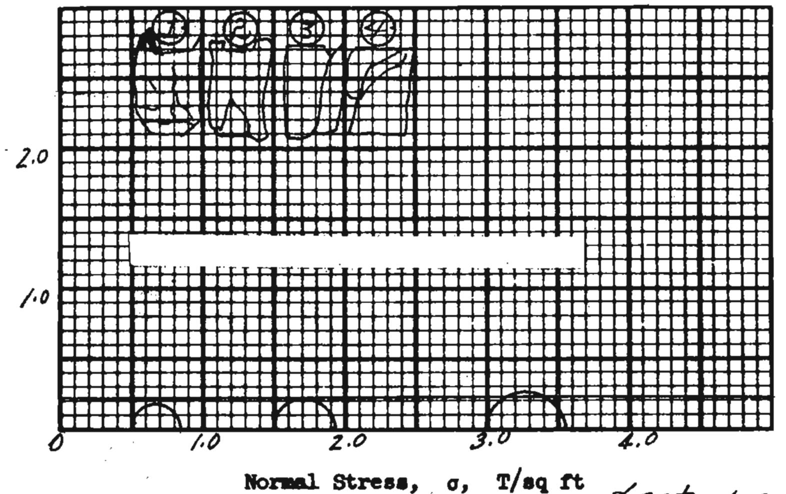
☒ Controlled strain

Type of test Q	Type of specimen UNDISTURBED			
Classification PLASTIC CLAY(CH), gray				
LL 96	PL 33	PI 63		G_s 2.73

Remarks ______

Project LK. PONT. LA.& VIC.-HURR. PROT. (70)	
ORLEANS FARICH LAKEFRONT LEVEE WEST OF IHNC;	
Area GDM NO. 2 SUPP NO. 5 (OUTFALL CANALS)	
Boring No. 6-OUW	Sample No. 9-D
~~Depth~~ El -25.2	Date 1 Dec. 1970
FAM TRIAXIAL COMPRESSION TEST REPORT	





$\gamma sat. = 102$

Test No.			1	2	3	4
Initial	Water content	w_o	65.1 %	61.7 %	61.7 %	61.5 %
	Void ratio	e_o	1.80	1.66	1.66	1.64
	Saturation	S_o	98.0 %	100+ %	100+ %	100+ %
	Dry density, lb/cu ft	γ_d	60.4	63.6	63.7	64.0
Before Shear	Water content	w_c	%	%	%	%
	Void ratio	e_c				
	Saturation	S_c	%	%	%	%
	Final back pressure, T/sq ft	u_o				
Final	Water content	w_f	%	%	%	%
	Void ratio	e_f				
Minor principal stress, T/sq ft		σ_3	0.5	1.5	3.0	0.5
Max deviator stress, T/sq ft		$(\sigma_1-\sigma_3)_{max}$	0.35	0.44	0.55	0.48
Time to failure, min		t_f	53	10	24	75
Rate of strain, percent/min			0.19	0.22	0.25	0.12
Ult deviator stress, T/sq ft		$(\sigma_1-\sigma_3)_{ult}$				
Initial diameter, in.		D_o	1.40	1.40	1.40	1.40
Initial height, in.		H_o	3.00	3.00	3.00	3.00

AVG. 62.5

Shear Strength Parameters

ϕ = 0°

tan ϕ = 0

c = .23 T/sq ft

Method of saturation ________

☐ Controlled stress

☒ Controlled strain

Type of test Q	Type of specimen UNDISTURBED			
Classification PLASTIC CLAY(CH),gray				
LL 85	PL 30	PI 55		G_s 2.71

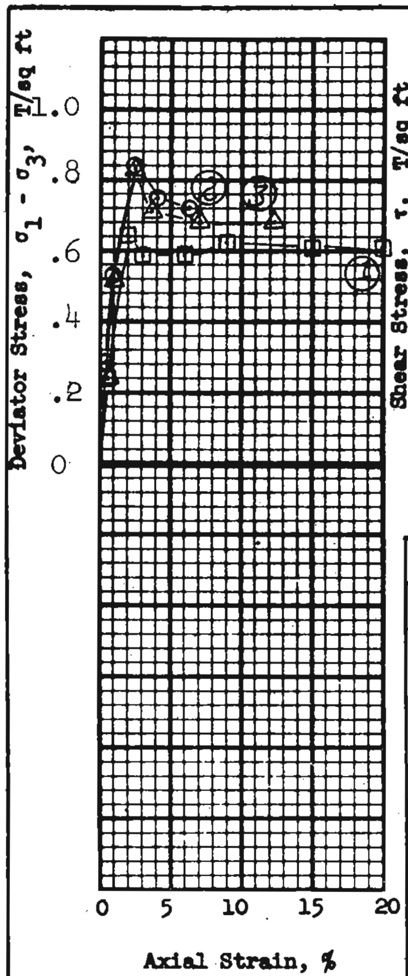
Remarks ________

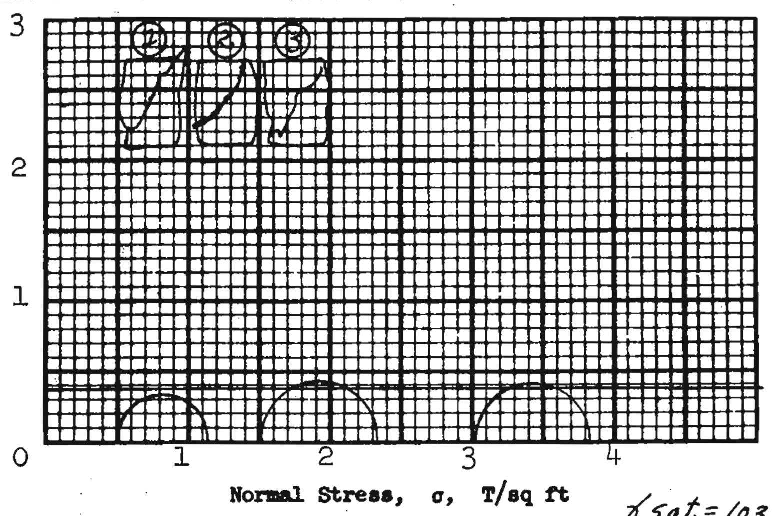
Project LK. PONT. LA.&VIC.-HURR. PROT. (70)

ORLEANS PARISH LAKE FRONT LEVEE WEST OF IHNC,

Area GDM NO.2, SUPP NO.5 (OUTFALL CANANLS)

Boring No. 6-OUW	Sample No. 10-B
~~Depth~~ El -27.4	Date 1 Dec. 1970
BCH	TRIAXIAL COMPRESSION TEST REPORT





$\gamma_{sat.} = 103$

Shear Strength Parameters

ϕ = 0 °

tan ϕ = 0

c = .385 T/sq ft

Method of saturation ________

☐ Controlled stress

☒ Controlled strain

Test No.			1	2	3	Avg.
Initial	Water content	w_o	59.8 %	60.6 %	55.4 %	58.6 %
	Void ratio	e_o	1.63	1.64	1.48	
	Saturation	S_o	98.0 %	98.7 %	99.9 %	%
	Dry density, lb/cu ft	γ_d	63.5	63.1	67.2	
Before Shear	Water content	w_c	%	%	%	%
	Void ratio	e_c				
	Saturation	S_c	%	%	%	%
	Final back pressure, T/sq ft	u_o				
Final	Water content	w_f	%	%	%	%
	Void ratio	e_f				
Minor principal stress, T/sq ft		σ_3	0.5	1.5	3.0	
Max deviator stress, T/sq ft		$(\sigma_1-\sigma_3)_{max}$	0.64	0.84	0.83	
Time to failure, min		t_f	14	19	23	
Rate of strain, percent/min			0.14	0.12	0.11	
Ult deviator stress, T/sq ft		$(\sigma_1-\sigma_3)_{ult}$				
Initial diameter, in.		D_o	1.42	1.42	1.42	
Initial height, in.		H_o	3.00	3.00	3.00	

Type of test Q	Type of specimen UNDISTURBED

Classification PLASTIC CLAY(CH),gray, contains scattered 1/8" to 1/4" dia.*

LL 71	PL 26	PI 45		G_s 2.67

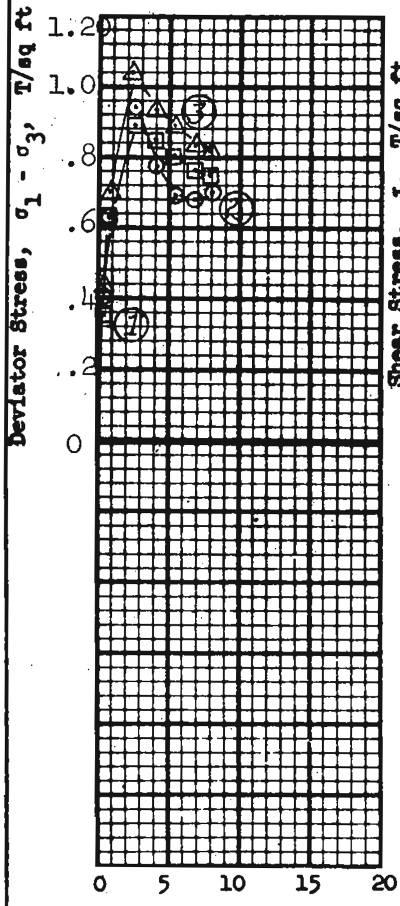
Remarks *pockets of silty sand

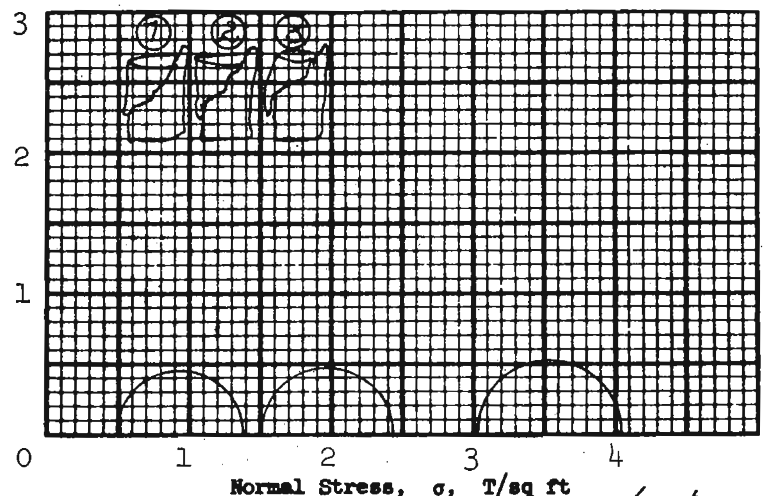
Project LK. PONT. LA.&VIC.-HURR. PROT.(70)
ORLEANS PARISH LAKEFRONT LEVEE WEST OF IHNC;

Area GDM NO. 2; SUPP. NO. 5 (OUTFALL CANALS)

Boring No. 6-OUW	Sample No. 16-C
~~Depth~~ El - 46.0	Date 1 Dec. 1970

JMS **TRIAXIAL COMPRESSION TEST REPORT**





γ sat. = 103

Test No.			1	2	3	Avg.
Initial	Water content	w_o	58.6 %	62.3 %	59.5 %	60.1 %
	Void ratio	e_o	1.59	1.68	1.62	
	Saturation	S_o	99.5 %	100+ %	99.2 %	%
	Dry density, lb/cu ft	γ_d	65.1	62.9	64.5	
Before Shear	Water content	w_c	%	%	%	%
	Void ratio	e_c				
	Saturation	S_c	%	%	%	%
	Final back pressure, T/sq ft	u_o				
Final	Water content	w_f	%	%	%	%
	Void ratio	e_f				
Minor principal stress, T/sq ft		σ_3	0.5	1.5	3.0	
Max deviator stress, T/sq ft		$(\sigma_1-\sigma_3)_{max}$	0.89	0.94	1.04	
Time to failure, min		t_f	25	25	22	
Rate of strain, percent/min			0.10	0.10	0.10	
Ult deviator stress, T/sq ft		$(\sigma_1-\sigma_3)_{ult}$				
Initial diameter, in.		D_o	1.40	1.39	1.40	
Initial height, in.		H_o	3.00	3.00	3.00	

Shear Strength Parameters

ϕ = 0°

tan ϕ = 0

c = .48 T/sq ft

Method of saturation ________

☐ Controlled stress

☒ Controlled strain

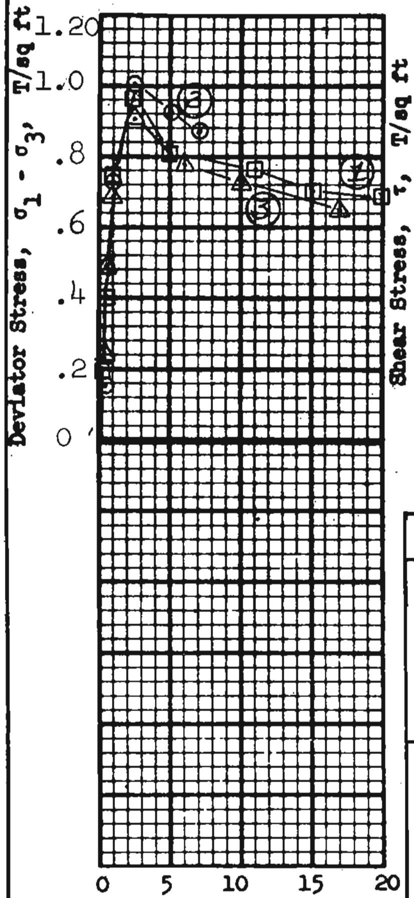
Type of test Q	Type of specimen UNDISTURBED
Classification PLASTIC CLAY(CH), gray, contains scattered shell fragments	
LL 83	PL 22
PI 61	G_s 2.70

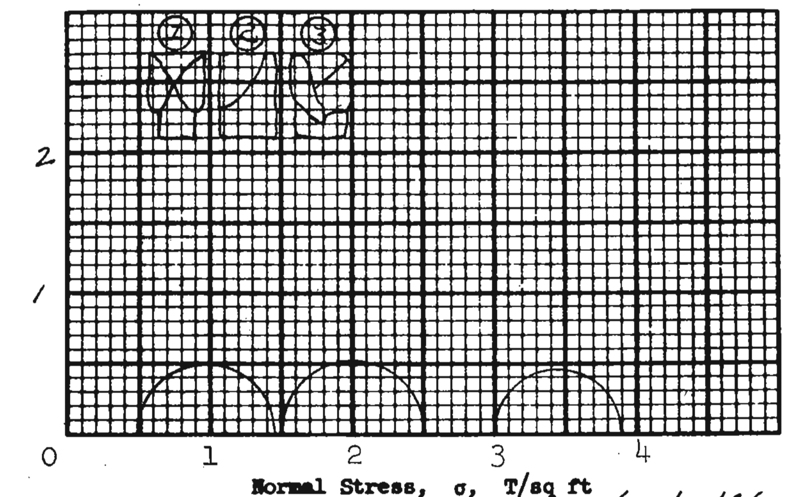
Remarks ________

Project LK. PONT. LA.&VIC.-HURR. PROT. (70)	
ORLEANS PARISH LAKEFRONT LEVEE WEST OF IHNC;	
Area GDM NO 2, SUPP NO. 5 (OUTFALL CANALS)	
Boring No. 6-OUW	Sample No. 17-C
~~Depth~~ El - 49.6	Date 1 Dec. 1970
TES	TRIAXIAL COMPRESSION TEST REPORT

ENG FORM 1 JUN 65 2089 (EM 1110-2-1902) PREVIOUS EDITIONS ARE OBSOLETE

TRANSLUCENT USAEWES SOILS TEST SECTION





γ sat. = 106

Test No.			1	2	3	Avg.
Initial	Water content	w_o	55.8 %	53.3 %	54.4 %	54.5 %
	Void ratio	e_o	1.53	1.47	1.51	
	Saturation	S_o	99.6 %	99.0 %	98.4 %	%
	Dry density, lb/cu ft	γ_d	67.3	68.9	67.9	
Before Shear	Water content	w_c	%	%	%	%
	Void ratio	e_c				
	Saturation	S_c	%	%	%	%
	Final back pressure, T/sq ft	u_o				
Final	Water content	w_f	%	%	%	%
	Void ratio	e_f				
Minor principal stress, T/sq ft		σ_3	0.5	1.5	3.0	
Max deviator stress, T/sq ft		$(\sigma_1-\sigma_3)_{max}$	0.96	1.00	0.90	
Time to failure, min		t_f	14	25	31	
Rate of strain, percent/min			0.18	0.10	0.08	✓
Ult deviator stress, T/sq ft		$(\sigma_1-\sigma_3)_{ult}$				
Initial diameter, in.		D_o	1.41	1.42	1.42	
Initial height, in.		H_o	3.00	3.00	3.00	

Shear Strength Parameters

ϕ = 0°

tan ϕ = 0

c = .475 T/sq ft

Method of saturation ________

☐ Controlled stress

☒ Controlled strain

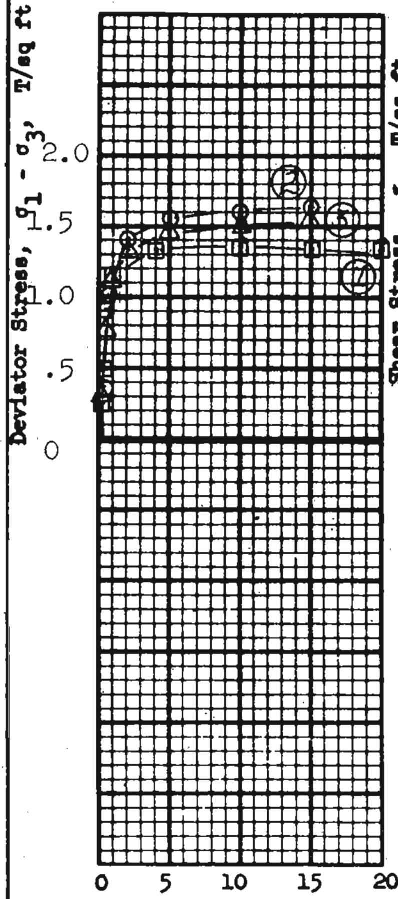
Type of test Q	Type of specimen UNDISTURBED			
Classification PLASTIC CLAY(CH), gray, contains 1/16" to 1/8" dia. shells				
LL 83	PL 23	PI 60		G_s 2.73

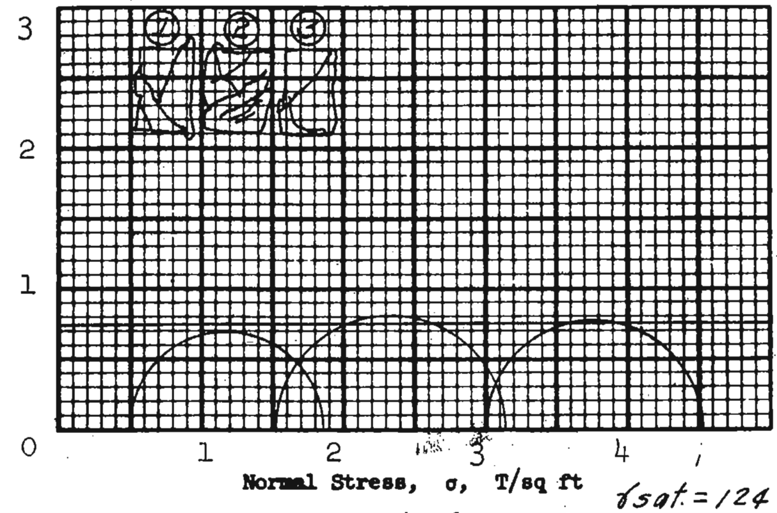
Remarks ________

Project LK. PONT. LA.&VIC.-HURR. PROT.(70)	
ORLEANS PARISH LAKE FRONT LEVEE WEST OF IHNC;	
Area GDM NO. 2, SUPP. NO.5(OUTFALL CANALS)	
Boring No. 6-OUW	Sample No. 18-B
~~Depth~~ El -51.9	Date 2 Dec. 1970
JMS TRIAXIAL COMPRESSION TEST REPORT	

ENG FORM 1 JUN 65 2089 (EM 1110-2-1902) PREVIOUS EDITIONS ARE OBSOLETE TRANSLUCENT

USAEWES SOILS TEST SECTION





$\gamma sat. = 124$

Test No.			1	2	3	Avg.
Initial	Water content	w_o	28.3 %	26.7 %	26.2 %	27.1 %
	Void ratio	e_o	0.765	0.729	0.717	
	Saturation	S_o	100+ %	99.6 %	99.4 %	%
	Dry density, lb/cu ft	γ_d	96.2	98.2	98.9	
Before Shear	Water content	w_c	%	%	%	%
	Void ratio	e_c				
	Saturation	S_c	%	%	%	%
	Final back pressure, T/sq ft	u_o				
Final	Water content	w_f	%	%	%	%
	Void ratio	e_f				
Minor principal stress, T/sq ft		σ_3	0.5	1.5	3.0	
Max deviator stress, T/sq ft		$(\sigma_1-\sigma_3)_{max}$	1.36	1.63	1.52	
Time to failure, min		t_f	42	48	31	
Rate of strain, percent/min			0.24	0.31	0.49	
Ult deviator stress, T/sq ft		$(\sigma_1-\sigma_3)_{ult}$				
Initial diameter, in.		D_o	1.40	1.40	1.40	
Initial height, in.		H_o	3.00	3.00	3.00	

Shear Strength Parameters

ϕ = 0°

tan ϕ = 0

c = 0.75 T/sq ft

Method of saturation ________

☐ Controlled stress

☒ Controlled strain

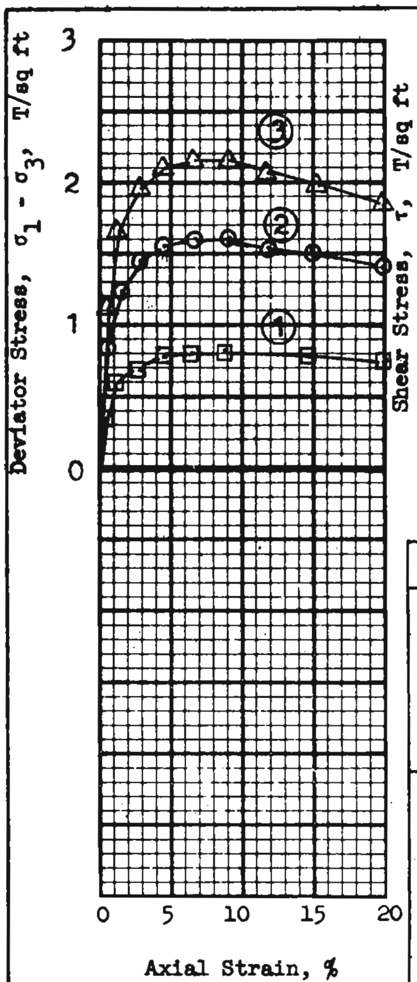
Type of test Q	Type of specimen UNDISTURBED			
Classification PLASTIC CIAY(CH),gray and greenish tan				
LL 89	PL 17	PI 72		G_s 2.72

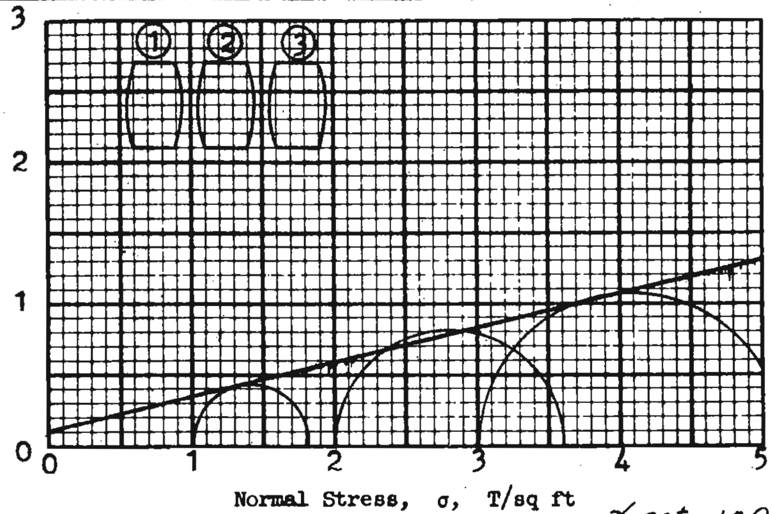
Remarks ________

Project LK. PONT. LA.&VIC.-HURR. PROT.(70)
ORLEANS PARISH LAKEFRONT LEVEE WEST OF IHNC.
Area GDM NO.2,SUPP. NO.5(OUTFALL CANALS)

Boring No. 6-OUW	Sample No. 19-C
~~Depth~~ El -57.1	Date 2 Dec. 1970

FAM **TRIAXIAL COMPRESSION TEST REPORT**





γ sat. = 100

Test No.			1	2	3	Avg.
Initial	Water content	w_o	69.3 %	63.8 %	68.0%	67.0%
	Void ratio	e_o	1.91	1.74	1.88	
	Saturation	S_o	98.0 %	99.0 %	97.6%	%
	Dry density, lb/cu ft	γ_d	58.0	61.5	58.6	
Before Shear	Water content	w_c	51.2 %	41.4 %	40.3%	%
	Void ratio	e_c	1.34	1.03	1.02	
	Saturation	S_c	100+ %	100+ %	100+%	%
	Final back pressure, PSI	u_o	78	78	78	
	Dry Density Lbs/cu.ft.	γ_d	72.1	83.1	83.6	
	Void ratio	e_f				
Minor principal stress, T/sq ft		σ_3	1.0	2.0	3.0	
Max deviator stress, T/sq ft		$(\sigma_1-\sigma_3)_{max}$	0.81	1.61	2.16	
Time to failure, min		t_f	148	131	96	
Rate of strain, percent/min			0.06	0.07	0.07	
Ult deviator stress, T/sq ft		$(\sigma_1-\sigma_3)_{ult}$				
Initial diameter, in.		D_o	1.39	1.39	1.39	
Initial height, in.		H_o	3.00	3.00	3.00	

Shear Strength Parameters

ϕ = 13°

tan ϕ = 0.23

c = 0.14 T/sq ft

Method of saturation BP

[ ] Controlled stress

[x] Controlled strain

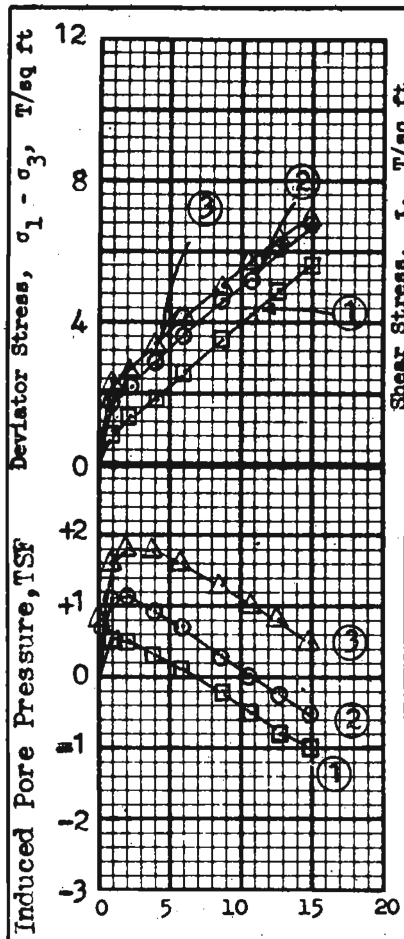
Type of test R	Type of specimen UNDISTURBED			
Classification PLASTIC CLAY(CH), gray, contains numerous 1/2" diameter shells				
LL 84	PL 25	PI 59		G_s 2.70

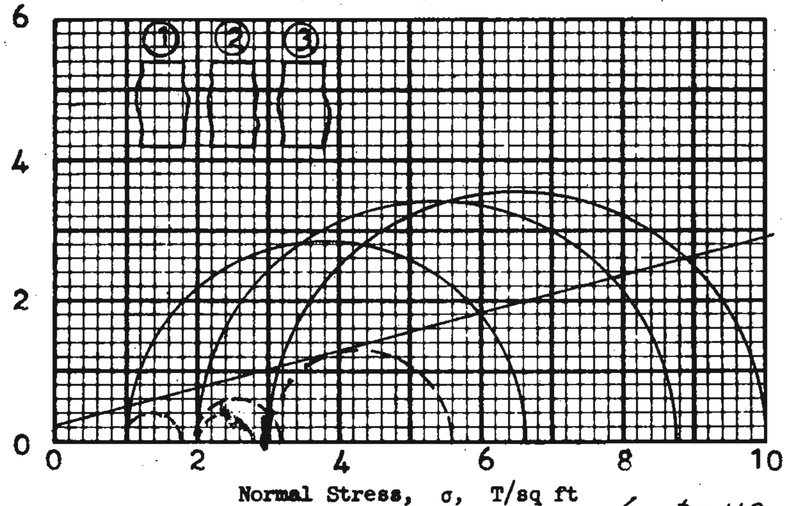
Remarks

Project LK.PONT, LA. & VIC. - HURR. PROT. (70)	
ORLEANS PARISH LAKEFRONT LEVEE WEST OF IHNC;	
Area GDM #2; SUPP. #5 (OUTFALL CANALS)	
Boring No. 6-OUW	Sample No. 3-D
~~Depth~~ El -5.2	Date 10 December, 1970
TES TRIAXIAL COMPRESSION TEST REPORT	

ENG FORM 1 JUN 65 2089 (EM 1110-2-1902) PREVIOUS EDITIONS ARE OBSOLETE TRANSLUCENT

USAEWES SOILS TEST SECTION





γsat.=119

Test No.			1	2	3	Avg.
Initial	Water content	w_o	30.4 %	31.2 %	31.0 %	30.9 %
	Void ratio	e_o	0.837	0.858	0.858	
	Saturation	S_o	97.7 %	97.8 %	97.2 %	%
	Dry density, lb/cu ft	γ_d	91.4	90.4	90.4	
Before Shear	Water content	w_c	29.5 %	29.9 %	29.0 %	%
	Void ratio	e_c	0.823	0.825	0.802	
	Saturation	S_c	96.4* %	97.5 %	97.3 %	%
	Final back pressure, PSI	u_o	80	80	80	
	Dry Density Lbs/cu.ft.	γ_d	92.1	92.0	93.2	
	Void ratio	e_f				
Minor principal stress, T/sq ft		σ_3	1.0	2.0	3.0	
Max deviator stress, T/sq ft		$(\sigma_1-\sigma_3)_{max}$	5.64	6.76	7.02	
Time to failure, min		t_f	273	273	273	
Rate of strain, percent/min			0.055	0.055	0.055	
$\sigma_1-\sigma_3$ (AT MAX. PORE PRESSURE			0.8	1.2	2.6	
Ult deviator stress, T/sq ft		$(\sigma_1-\sigma_3)_{ult}$				
Initial diameter, in.		D_o	1.40	1.40	1.40	
Initial height, in.		H_o	3.00	3.00	3.00	

Shear Strength Parameters

ϕ = 15°

tan ϕ = 0.268

c = 0.200 T/sq ft

Method of saturation BP

☐ Controlled stress

☒ Controlled strain

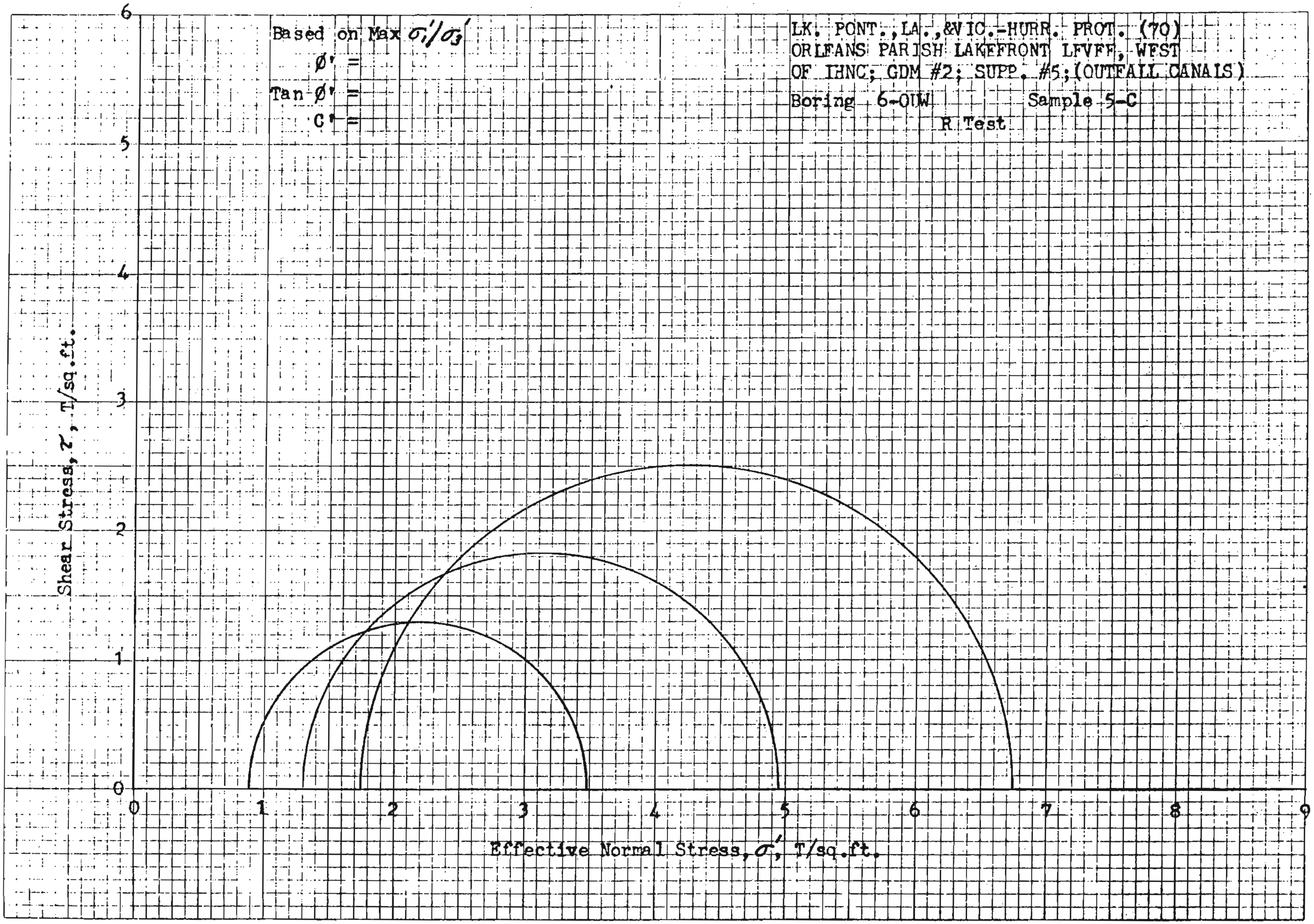
Type of test R	Type of specimen UNDISTURBED		
Classification SILT(ML), gray, contains shells up to 3/4" in size			
LL 25	PL 23	PI 2	G_s 2.69

Remarks * Pore Pressure response indicated 100% saturation See attached plot for effective values

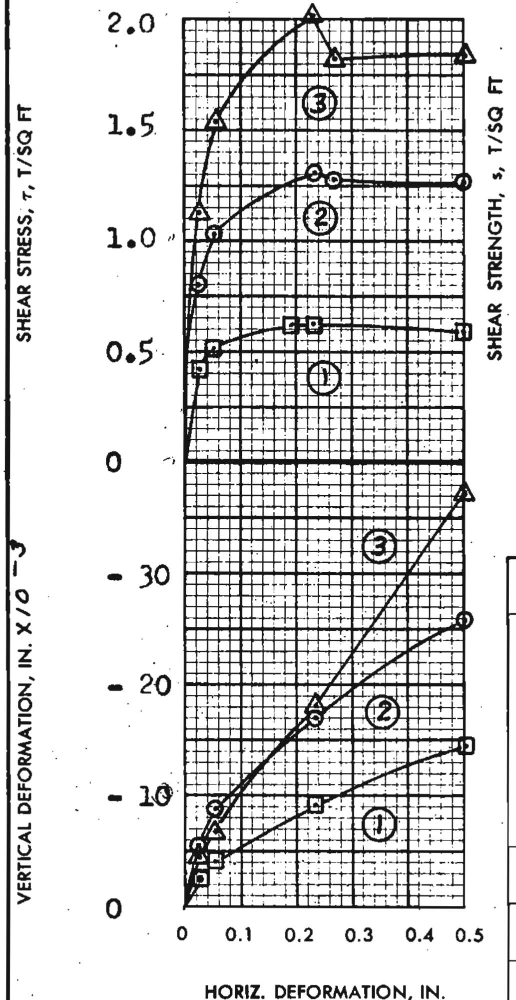
Project LK. PONT., LA. & VIC-HURR. PROT.(70)	
ORLEANS PARISH LAKEFRONT LEVEE, WEST OF IHNC	
Area GDM #2; SUPP. #5; (OUTFALL CANALS)	
Boring No. 6-OUW	Sample No. 5-C
~~Depth~~ El - 12.6	Date 28 January, 1971
PJR	TRIAXIAL COMPRESSION TEST REPORT

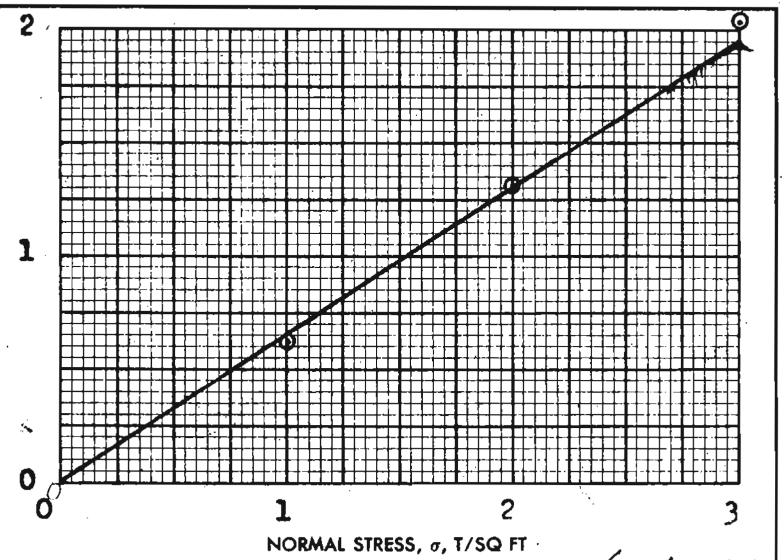
ENG FORM 1 JUN 65 2089 (EM 1110-2-1902) PREVIOUS EDITIONS ARE OBSOLETE

TRANSLUCENT


Based on Max σ_1'/σ_3'
Ø' =
Tan Ø' =
C' =
LK. PONT., LA., &VIC.-HURR. PROT. (70)
ORLEANS PARISH LAKEFRONT LEVEE, WEST
OF IHNC; GDM #2; SUPP. #5; (OUTFALL CANALS)
Boring 6-OUW
Sample 5-C
R Test
Shear Stress, τ, T/sq.ft.
Effective Normal Stress, σ', T/sq.ft.
0
1
2
3
4
5
6
7
8
9

62





$\gamma_{sat.} = 118$

TEST NO.			1	2	3	Avg.
INITIAL	WATER CONTENT	w_o	33.0 %	35.1 %	32.6 %	33.6%
	VOID RATIO	e_o	0.881	0.940	0.883	
	SATURATION	S_o	100 %	99.7 %	87.0%	%
	DRY DENSITY, LB/CU FT	γ_d	88.6	85.9	88.5	
VOID RATIO AFTER CONSOLIDATION		e_c				
TIME FOR 50 PERCENT CONSOLIDATION, MIN		t_{50}	<1	<1	<1	
FINAL	WATER CONTENT	w_f	30.4 %	30.4%	29.8%	%
	VOID RATIO	e_f				
	SATURATION	S_f	%	%	%	%
NORMAL STRESS, T/SQ FT		σ	1.0	2.0	3.0	
MAXIMUM SHEAR STRESS, T/SQ FT		τ_{max}	0.62	1.31	2.03	
ACTUAL TIME TO FAILURE, MIN		t_f	1140	1320	1320	
RATE OF STRAIN, IN./MIN			.00018	.00018	.00018	
ULTIMATE SHEAR STRESS, T/SQ FT		τ_{ult}				

SHEAR STRENGTH PARAMETERS

ϕ' = 33°

TAN ϕ' = 0.649

c' = 0 T/SQ FT

☐ CONTROLLED STRESS

☒ CONTROLLED STRAIN

TYPE OF SPECIMEN UNDISTURBED		3.00 IN. SQUARE	1&2=0.550 3=0.625 IN. THICK	
CLASSIFICATION SILT(ML), gray				
LL 29	PL 27	PI 2		G_s 2.67

REMARKS

PROJECT LK. PONT. LA.,& VIC. - HURR. PROT. (70)
ORLEANS PARISH LAKE FRONT LEVEE, WEST OF IHNC

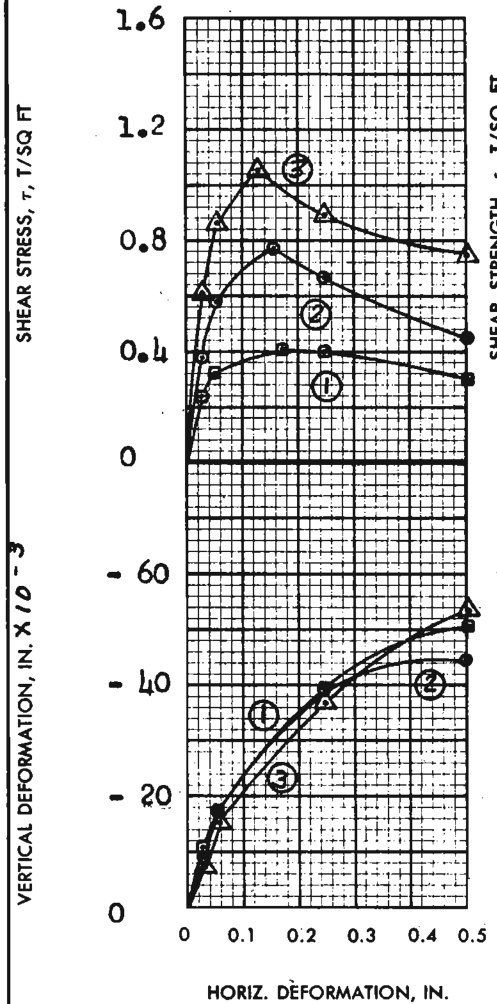
AREA G.D.M. # 2, SUPP. # 5 (OUTFALL CANALS)

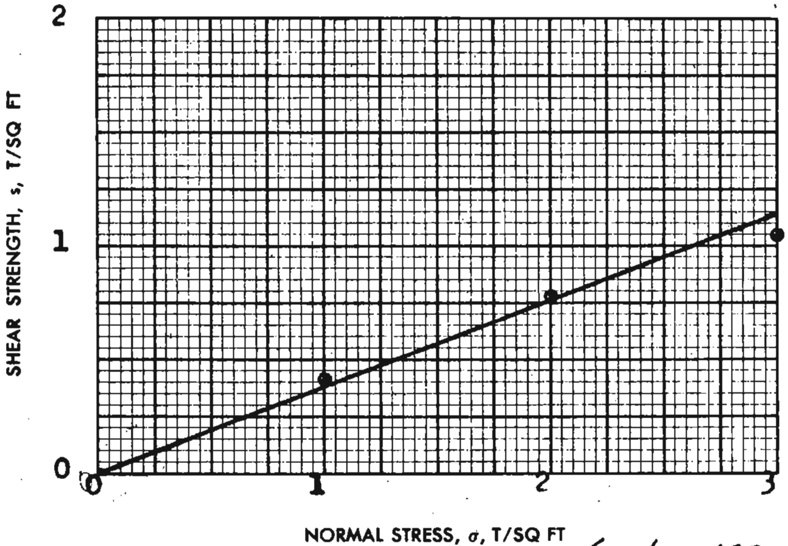
BORING NO. 6-OUW SAMPLE NO. 8-B

~~DEPTH~~ EL - 19.4 DATE 14 Dec. 1970

BWG DIRECT SHEAR TEST REPORT

ENG FORM 1 JUN 65 2092 (EM 1110-2-1906) PREVIOUS EDITIONS ARE OBSOLETE (TRANSLUCENT) 63 USAEWES SOILS TEST SECTION





$\gamma sat. = 103$

TEST NO.			1	2	3	Avg.
INITIAL	WATER CONTENT	w_o	57.1 %	57.9 %	58.1 %	57.7%
	VOID RATIO	e_o	1.59	1.61	1.63	
	SATURATION	S_o	97.3 %	97.5 %	96.6 %	%
	DRY DENSITY, LB/CU FT	γ_d	65.3	64.9 ,	64.2	
VOID RATIO AFTER CONSOLIDATION		e_c				
TIME FOR 50 PERCENT CONSOLIDATION, MIN		t_{50}	2	2	5	
FINAL	WATER CONTENT	w_f	52.2 %	46.8 %	43.3 %	%
	VOID RATIO	e_f				
	SATURATION	S_f	%	%	%	%
NORMAL STRESS, T/SQ FT		σ	1.0	2.0	3.0	
MAXIMUM SHEAR STRESS, T/SQ FT		τ_{max}	0.41	0.77	1.05	
ACTUAL TIME TO FAILURE, MIN		t_f	960	870	720	
RATE OF STRAIN, IN./MIN			.00019	.00019	.00019	
ULTIMATE SHEAR STRESS, T/SQ FT		τ_{ult}				

SHEAR STRENGTH PARAMETERS

ϕ' = 21°

TAN ϕ' = 0.382

c' = 0 T/SQ FT

☐ CONTROLLED STRESS

☒ CONTROLLED STRAIN

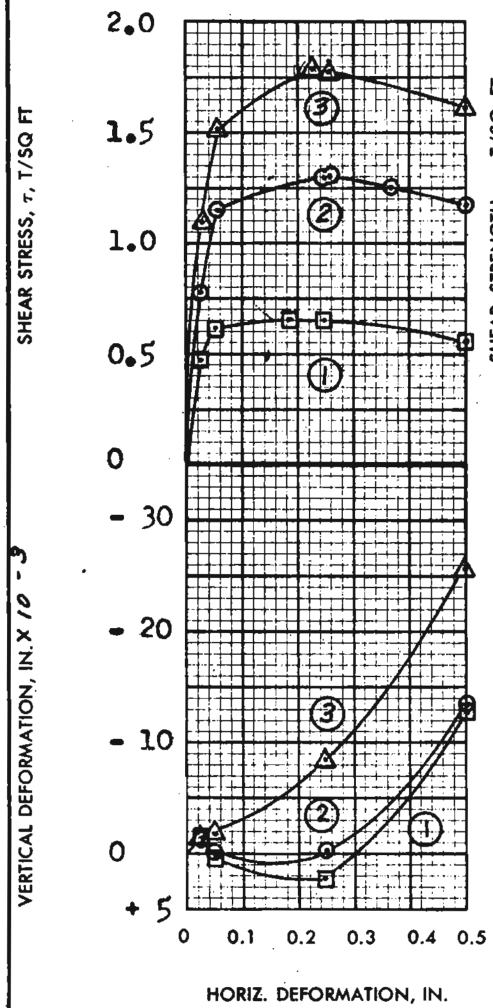
TYPE OF SPECIMEN	UNDISTURBED		3.00	IN. SQUARE	1&2=0.560 3=0.625	IN. THICK
CLASSIFICATION	PLASTIC CLAY(CH),gray					
LL	PL	PI			G_s	2.71

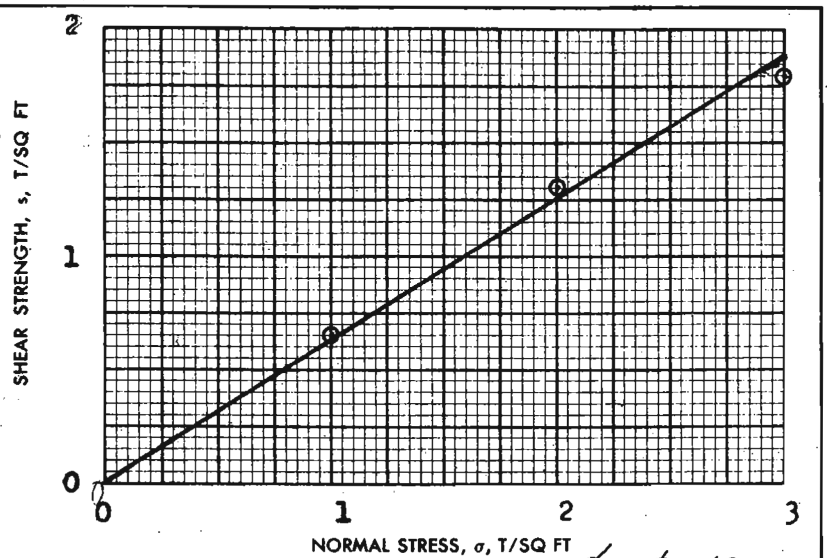
REMARKS

PROJECT	LK. PONT. LA.,& VIC. -HURR.PROT. (70)
	ORLEANS PARISH LAKE FRONT LEVEE, WEST OF IHNC
AREA	G.D.M. # 2, SUPP. # 5(OUTFALL CANALS)
BORING NO. 6-OUW	SAMPLE NO. 10-B
~~DEPTH~~ EL - 27.4	DATE 14 Dec. 1970
WJH	DIRECT SHEAR TEST REPORT

USAEWES SOILS TEST S...

ENG FORM 1 JUN 65 2092 (EM 1110-2-1906) PREVIOUS EDITIONS ARE OBSOLETE (TRANSLUCENT) GPO : 1966 OF—214-945





$\gamma_{sat} = 122$

TEST NO.			1	2	3	Avg.
INITIAL	WATER CONTENT	w_o	27.0 %	26.8 %	26.3 %	26.7 %
	VOID RATIO	e_o	0.752	0.746	0.741	
	SATURATION	S_o	95.5 %	95.6 %	94.4 %	%
	DRY DENSITY, LB/CU FT	γ_d	94.8	95.1	95.4	
VOID RATIO AFTER CONSOLIDATION		e_c				
TIME FOR 50 PERCENT CONSOLIDATION, MIN		t_{50}				
FINAL	WATER CONTENT	w_f	26.0 %	25.6 %	24.6 %	%
	VOID RATIO	e_f				
	SATURATION	S_f	%	%	%	%
NORMAL STRESS, T/SQ FT		σ	1.0	2.0	3.0	
MAXIMUM SHEAR STRESS, T/SQ FT		τ_{max}	0.65	1.30	1.79	
ACTUAL TIME TO FAILURE, MIN		t_f	1020	1380	1200	
RATE OF STRAIN, IN./MIN			.00019	.00019	.00019	
ULTIMATE SHEAR STRESS, T/SQ FT		τ_{ult}				

SHEAR STRENGTH PARAMETERS

ϕ' = 32°

TAN ϕ' = 0.632

c' = 0 T/SQ FT

☐ CONTROLLED STRESS

☒ CONTROLLED STRAIN

TYPE OF SPECIMEN	UNDISTURBED	3.00 IN. SQUARE	0.560 IN. THICK
CLASSIFICATION	SILTY SAND(SM), gray, contains small shells		
LL -	PL -	PI -	G_s 2.66

REMARKS

PROJECT LK. PONT. LA., & VIC- HURR. PROT. (70)

ORLEANS PARISH LAKE FRONT LEVEE, WEST OF IHNC

AREA G.D.M. # 2, SUPP. # 5 (OUTFALL CANALS)

BORING NO. 6-OUW | SAMPLE NO. 13-B

~~DEPTH~~ EL - 35.2 | DATE 15 Dec. 1970

BWG USAEWES SOILS TEST SECTION

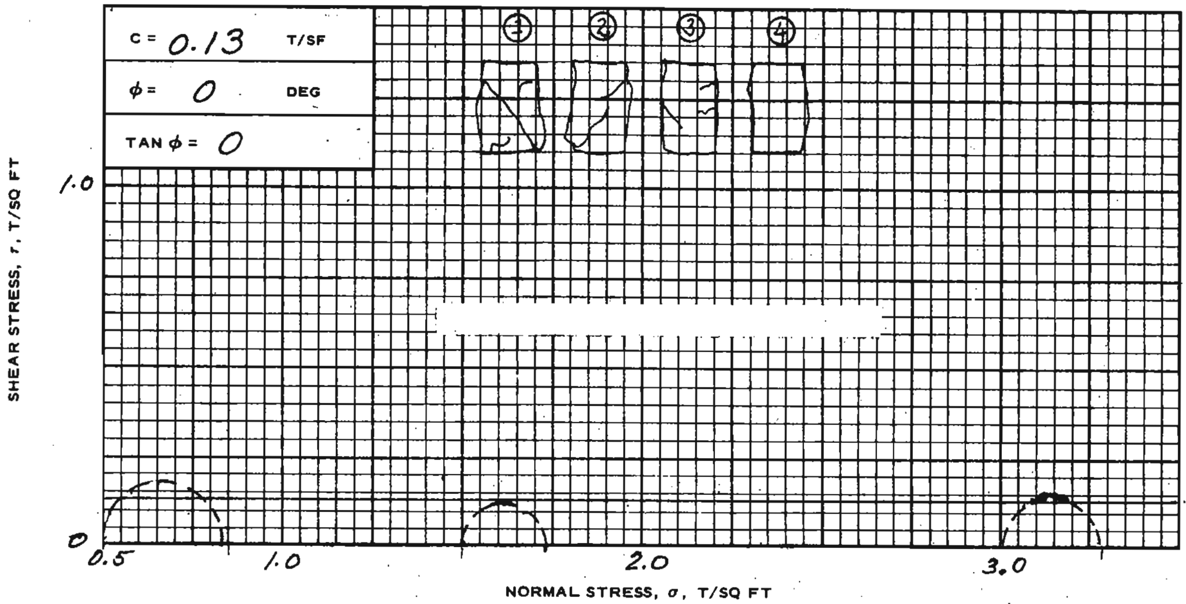
DIRECT SHEAR TEST REPORT

ENG FORM 1 JUN 65 2092 (EM 1110-2-1906) PREVIOUS EDITIONS ARE OBSOLETE (TRANSLUCENT) 605 GPO : 1966 OF—214-945 PLATE IX-3

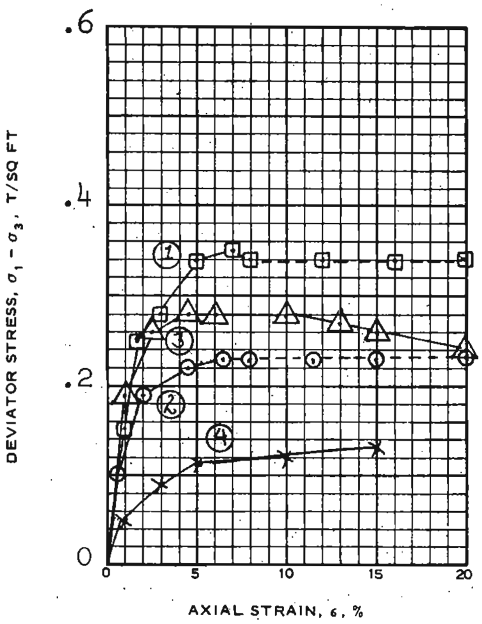
C = 0.13 T/SF

ϕ = 0 DEG

TAN ϕ = 0



sat. γ = 113.8



SPECIMEN NO.			1	2	3	4	
INITIAL	WATER CONTENT, %	w_o	36.1	43.6	43.6	40.8	Avg. 41.0
	DRY DENSITY LB/CU FT	γd_o	85.8	78.8	78.5	80.0	
	SATURATION, %	S_o	100+	100+	100+	100+	
	VOID RATIO	e_o	0.950	1.12	1.13	1.09	
BEFORE SHEAR	WATER CONTENT, %	w_c					
	DRY DENSITY LB/CU FT	γd_c					
	SATURATION, %	S_c					
	VOID RATIO	e_c					
	FINAL BACK PRESSURE, T/SQ FT	u_o					
MINOR PRINCIPAL STRESS, T/SQ FT		σ_3	0.5	1.5	3.0	1.5	
MAXIMUM DEVIATOR STRESS, T/SQ FT		$(\sigma_1 - \sigma_3)_{MAX}$	0.35	0.23	0.28	0.13	
TIME TO $(\sigma_1 - \sigma_3)_{MAX}$, MIN		t_f	35	12	9	26	
ULTIMATE DEVIATOR STRESS, T/SQ FT		$(\sigma_1 - \sigma_3)_{ULT}$					
INITIAL DIAMETER, IN.		D_o	1.40	1.39	1.39	1.39	
INITIAL HEIGHT, IN.		H_o	3.00	3.00	3.00	3.00	

CONTROLLED- strain TEST

DESCRIPTION OF SPECIMENS LEAN CLAY(CL),gray;lenses and layers of sandy silt;a few shells

LL 40	PL 18	PI 22	Gs 2.68	TYPE OF SPECIMEN UNDISTURBED	TYPE OF TEST Q

REMARKS: --- Rate of strain increased.

PROJECT LK.PONT.LA.&VIC.-HURR. PROT-ORLEANS PARISH OUTFALL CANALS-ORLEANS ST. CANAL

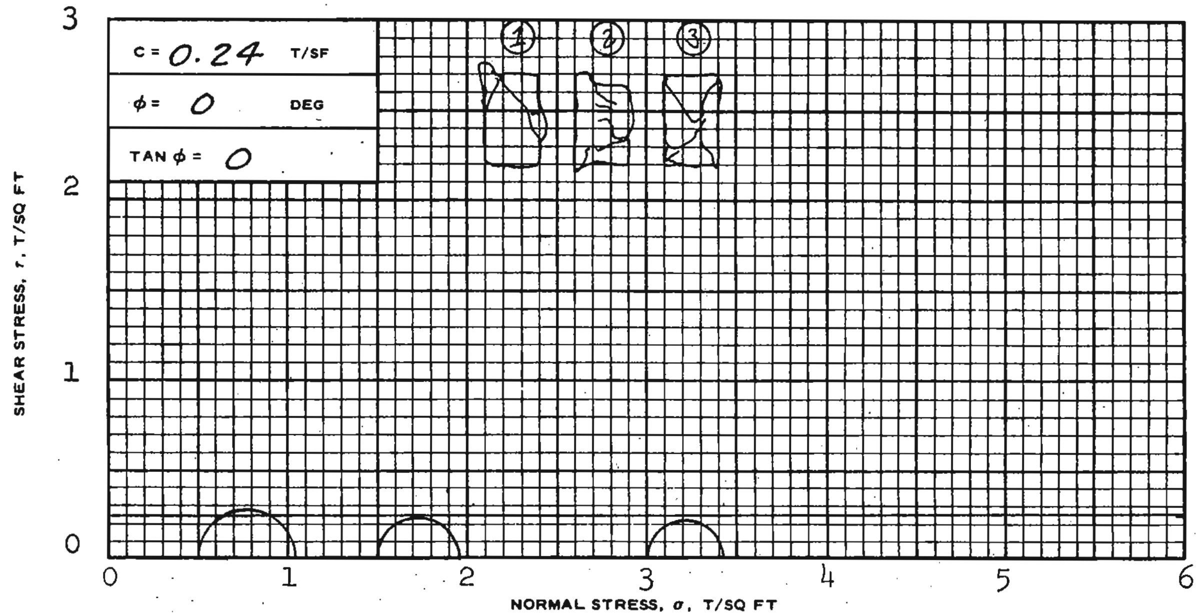
BORING NO. 1-UOP — SAMPLE NO. 2-C

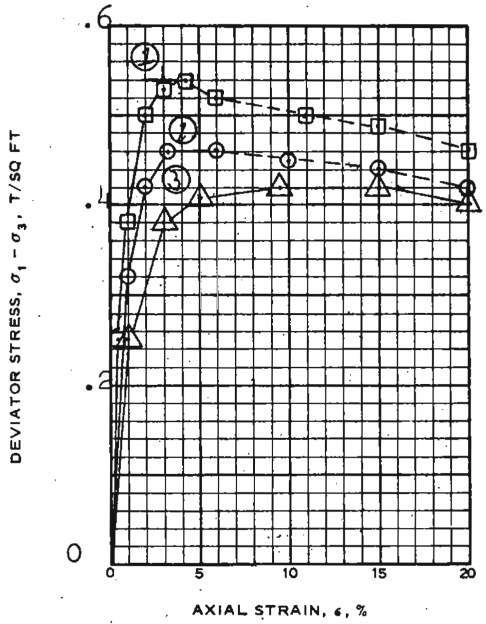
DEPTH/ELEV 4.9/-2.1

LABORATORY USAEWES — DATE 17 August. 1973

PJR **TRIAXIAL COMPRESSION TEST REPORT**

ENG FORM NO. 2089 REV JUNE 1970 — PREVIOUS EDITION IS OBSOLETE — TRANSLUCENT — *(EM 1110-2-1906)*





sat.γ = 106.2

SPECIMEN NO.			1	2	3	Avg.
INITIAL	WATER CONTENT, %	w_o	56.1	53.6	52.6	54.1
	DRY DENSITY LB/CU FT	γ_{d_o}	67.5	69.1	69.9	
	SATURATION, %	S_o	100+	99.2	99.4	
	VOID RATIO	e_o				
BEFORE SHEAR	WATER CONTENT, %	w_c				
	DRY DENSITY LB/CU FT	γ_{d_c}				
	SATURATION, %	S_c				
	VOID RATIO	e_c				
	FINAL BACK PRESSURE, T/SQ FT	u_o				
MINOR PRINCIPAL STRESS, T/SQ FT		σ_3	0.5	1.5	3.0	
MAXIMUM DEVIATOR STRESS, T/SQ FT		$(\sigma_1 - \sigma_3)_{MAX}$	0.54	0.46	0.42	
TIME TO $(\sigma_1 - \sigma_3)_{MAX}$, MIN		t_f	10	8	24	
ULTIMATE DEVIATOR STRESS, T/SQ FT		$(\sigma_1 - \sigma_3)_{ULT}$				
INITIAL DIAMETER, IN.		D_o	1.40	1.40	1.40	
INITIAL HEIGHT, IN.		H_o	3.00	3.00	3.00	

CONTROLLED- strain TEST

DESCRIPTION OF SPECIMENS PLASTIC CLAY(CH),gray;silt lenses;approx. 1/16" thick;a few shell fragments

LL 71	PL 24	PI 47	Gs 2.74	TYPE OF SPECIMEN UNDISTURBED	TYPE OF TEST Q

REMARKS: --- Rate of strain increased.

PROJECT LK.PONT.LA.&VIC.-HURR. PROT-ORLEANS PARISH OUTFALL CANALS-ORLEANS ST. CANAL

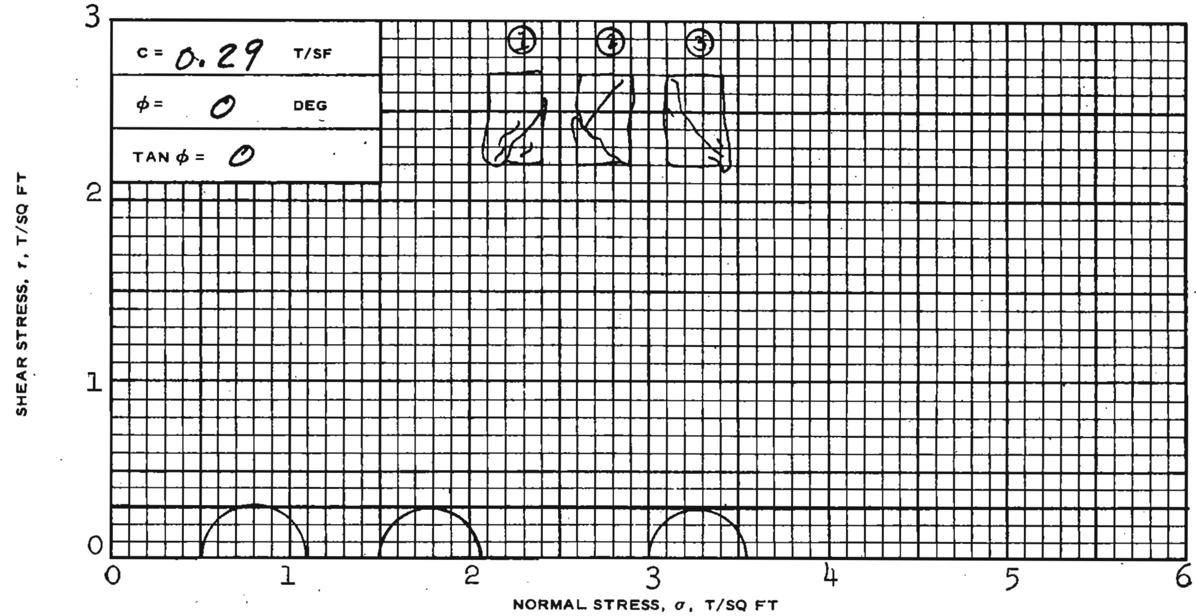
BORING NO. 1-UOP SAMPLE NO. 4-B

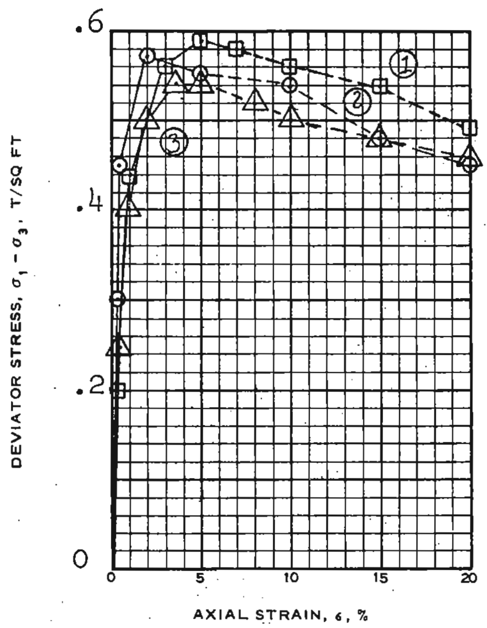
DEPTH/ELEV 12.0/-9.2

LABORATORY USAEWES DATE 17 August 1973

PJR TRIAXIAL COMPRESSION TEST REPORT

ENG FORM NO. 2089 REV JUNE 1970 PREVIOUS EDITION IS OBSOLETE TRANSLUCENT (EM 1110-2-1906)





sat. γ = 98.8

SPECIMEN NO.			1	2	3	Avg.
INITIAL	WATER CONTENT, %	w_o	73.3	73.1	73.6	73.3
	DRY DENSITY LB/ CU FT	γd_o	56.8	57.4	56.7	
	SATURATION, %	S_o	99.8	100+	100+	
	VOID RATIO	e_o	2.02	1.99	2.03	
BEFORE SHEAR	WATER CONTENT, %	w_c				
	DRY DENSITY LB/CU FT	γd_c				
	SATURATION, %	S_c				
	VOID RATIO	e_c				
	FINAL BACK PRESSURE, T/SQ FT	u_o				
MINOR PRINCIPAL STRESS, T/SQ FT		σ_3	0.5	1.5	3.0	
MAXIMUM DEVIATOR STRESS, T/SQ FT		$(\sigma_1 - \sigma_3)_{MAX}$	0.59	0.57	0.54	
TIME TO $(\sigma_1 - \sigma_3)_{MAX}$, MIN		t_f	14	6	14	
ULTIMATE DEVIATOR STRESS, T/SQ FT		$(\sigma_1 - \sigma_3)_{ULT}$				
INITIAL DIAMETER, IN.		D_o	1.40	1.40	1.40	
INITIAL HEIGHT, IN.		H_o	3.00	3.00	3.00	

CONTROLLED- strain TEST

DESCRIPTION OF SPECIMENS PLASTIC CLAY(CH),gray

LL	PL	PI	Gs	TYPE OF SPECIMEN	TYPE OF TEST
94	27	67	2.75	UNDISTURBED	Q

REMARKS: --- Rate of strain increased.

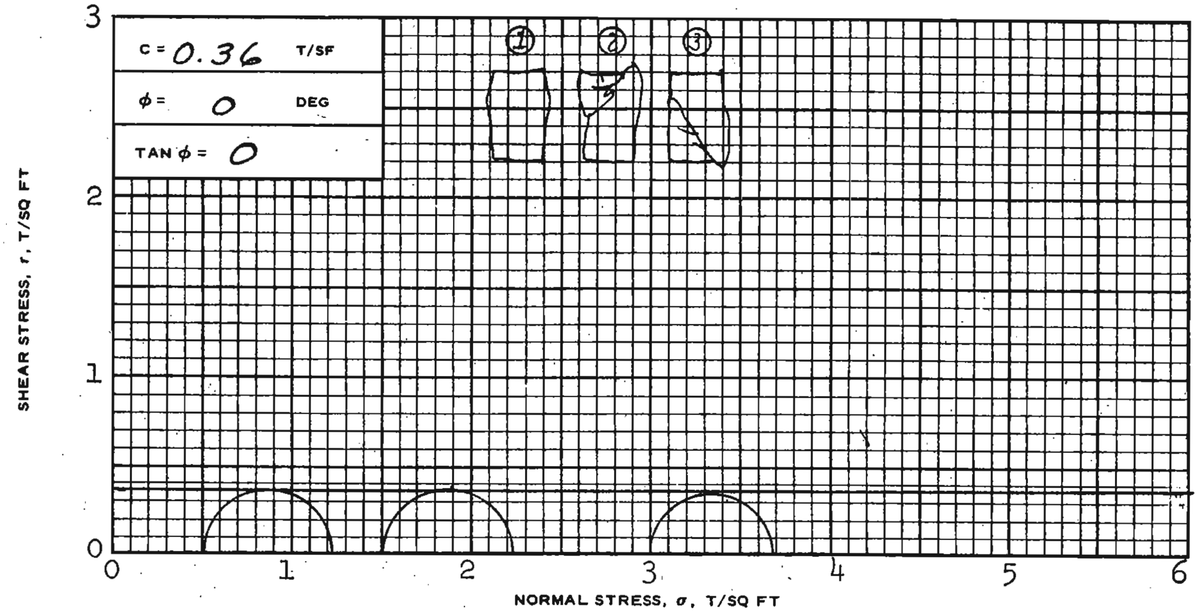
PROJECT LK.PONT.LA.&VIC-HURR.PROT-ORLEANS PARISH OUTFALL CANALS-ORLEANS ST.CANAL

BORING NO. 1-UOP SAMPLE NO. 8-D

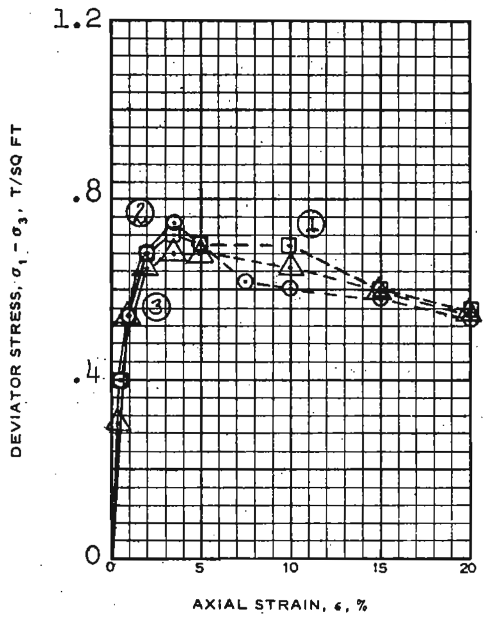
DEPTH/ELEV 29.7/-26.9

LABORATORY USAEWES DATE 18 August 1973

PJR TRIAXIAL COMPRESSION TEST REPORT



Sat. γ = 104.1



SPECIMEN NO.			1	2	3	Avg.
INITIAL	WATER CONTENT, %	w_o	54.9	57.3	58.1	56.8
	DRY DENSITY LB/CU FT	γd_o	67.3	65.9	65.4	
	SATURATION, %	S_o	98.2	100+	98.8	
	VOID RATIO	e_o	1.52	1.52	1.60	
BEFORE SHEAR	WATER CONTENT, %	w_c				
	DRY DENSITY LB/CU FT	γd_c				
	SATURATION, %	S_c				
	VOID RATIO	e_c				
	FINAL BACK PRESSURE, T/SQ FT	u_o				
MINOR PRINCIPAL STRESS, T/SQ FT		σ_3	0.5	1.5	3.0	
MAXIMUM DEVIATOR STRESS, T/SQ FT		$(\sigma_1 - \sigma_3)_{MAX}$	0.72	0.74	0.68	
TIME TO $(\sigma_1 - \sigma_3)_{MAX}$, MIN		t_f	10	10	10	
ULTIMATE DEVIATOR STRESS, T/SQ FT		$(\sigma_1 - \sigma_3)_{ULT}$				
INITIAL DIAMETER, IN.		D_o	1.40	1.40	1.40	
INITIAL HEIGHT, IN.		H_o	3.00	3.00	3.00	

CONTROLLED- strain TEST

DESCRIPTION OF SPECIMENS PLASTIC CLAY(CH),gray;a few small sand lenses

LL 73	PL 25	PI 48	Gs 2.72	TYPE OF SPECIMEN UNDISTURBED	TYPE OF TEST Q

REMARKS: --- Rate of strain increased.

PROJECT LK.PONT.LA.&VIC.-HURR. PROT.-ORLEANS PARISH OUTFALL CANALS-ORLEANS ST.CANAL

BORING NO. 1-UOP SAMPLE NO. 9-C

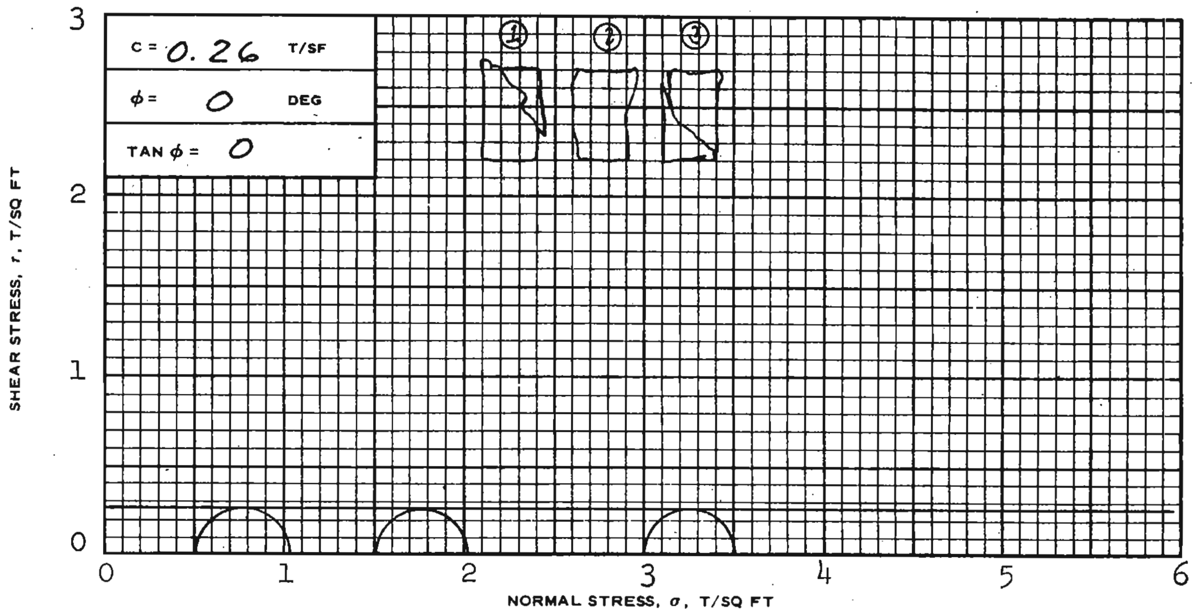
DEPTH/ELEV 32.9/-30.1

LABORATORY USAEWES DATE 18 August 1973

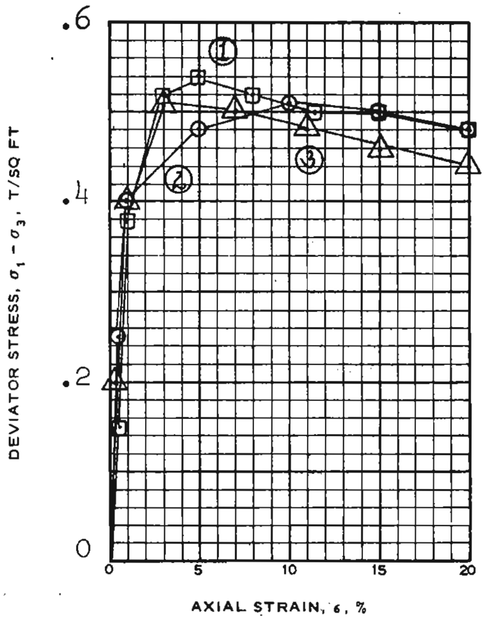
PJR

TRIAXIAL COMPRESSION TEST REPORT

ENG FORM NO. 2089 REV JUNE 1970 PREVIOUS EDITION IS OBSOLETE TRANSLUCENT *(EM 1110-2-1906)*



Sat.γ = 101.2



	SPECIMEN NO.		1	2	3	Avg.
INITIAL	WATER CONTENT, %	w_o	62.3	62.4	68.3	64.3
	DRY DENSITY LB/CU FT	γd_o	62.6	62.2	59.1	
	SATURATION, %	S_o	98.9	97.9	99.2	
	VOID RATIO	e_o	1.72	1.74	1.88	
BEFORE SHEAR	WATER CONTENT, %	w_c				
	DRY DENSITY LB/CU FT	γd_c				
	SATURATION, %	S_c				
	VOID RATIO	e_c				
	FINAL BACK PRESSURE, T/SQ FT	u_o				
MINOR PRINCIPAL STRESS, T/SQ FT		σ_3	0.5	1.5	3.0	
MAXIMUM DEVIATOR STRESS, T/SQ FT		$(\sigma_1 - \sigma_3)_{MAX}$	0.54	0.51	0.51	
TIME TO $(\sigma_1 - \sigma_3)_{MAX}$, MIN		t_f	15	37	8	
ULTIMATE DEVIATOR STRESS, T/SQ FT		$(\sigma_1 - \sigma_3)_{ULT}$				
INITIAL DIAMETER, IN.		D_o	1.39	1.40	1.40	
INITIAL HEIGHT, IN.		H_o	3.00	3.00	3.00	

CONTROLLED- strain TEST

DESCRIPTION OF SPECIMENS PLASTIC CLAY(CH),gray;small shells

LL 83	PL 25	PI 58	Gs 2.73	TYPE OF SPECIMEN UNDISTURBED	TYPE OF TEST Q

REMARKS:

PROJECT LK.PONT.LA.&VIC-HURR.PROT-ORLEANS PARISH OUTFALL CANALS-ORLEANS ST.CANAL

BORING NO. 1-UOP	SAMPLE NO. 13-D
DEPTH/ELEV 49.8/-47.0	
LABORATORY USAEWES	DATE 25 August 1973

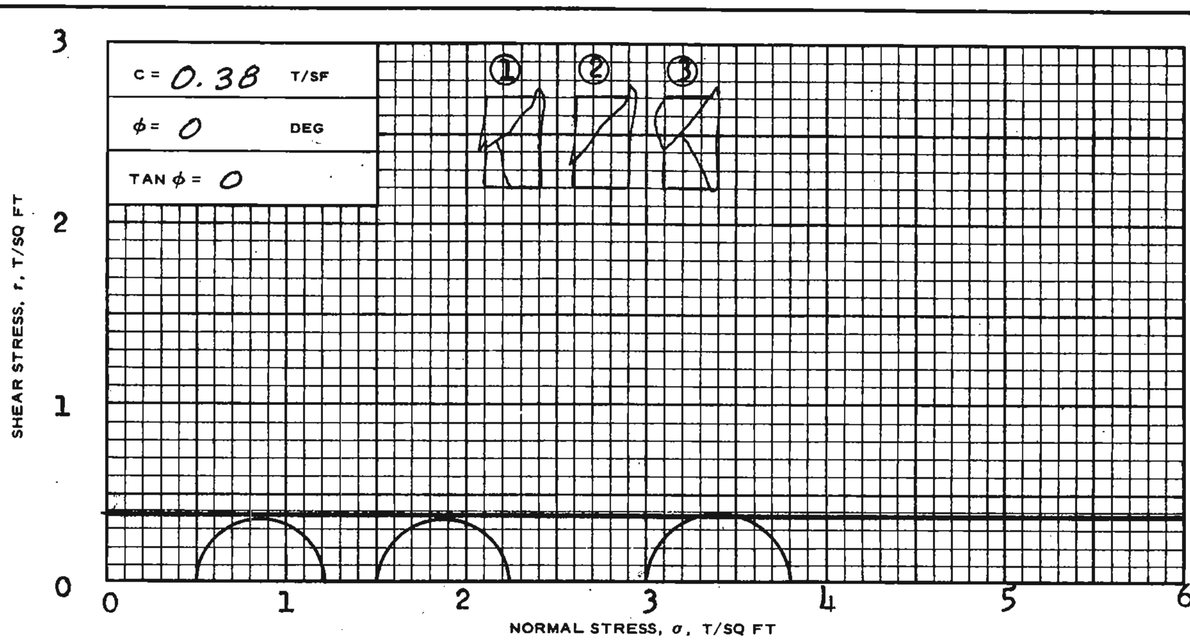
WJH **TRIAXIAL COMPRESSION TEST REPORT**

ENG FORM NO. 2089 REV JUNE 1970 PREVIOUS EDITION IS OBSOLETE TRANSLUCENT (EM 1110–2–1906)

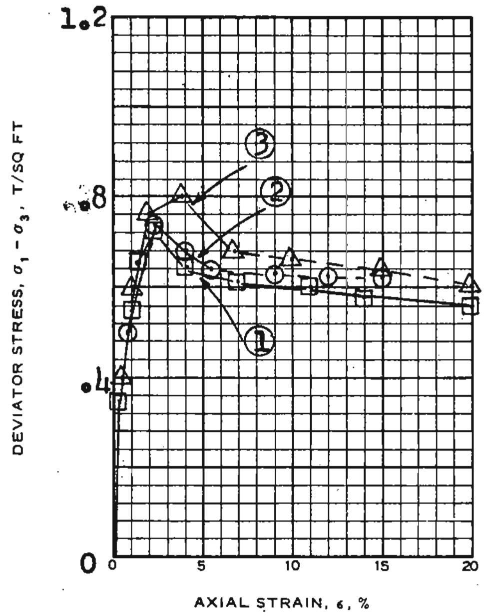
c = 0.38 T/SF

φ = 0 DEG

TAN φ = 0



sat.γ = 106.9



				1	2	3	Avg.
SPECIMEN NO.				1	2	3	Avg.
INITIAL	WATER CONTENT, %		w_o	52.8	51.7	51.3	34.8
INITIAL	DRY DENSITY LB/ CU FT		γd_o	69.6	70.3	70.8	
INITIAL	SATURATION, %		s_o	99.7	99.0	99.7	
INITIAL	VOID RATIO		e_o	1.44	1.42	1.40	
BEFORE SHEAR	WATER CONTENT, %		w_c				
BEFORE SHEAR	DRY DENSITY LB/CU FT		γd_c				
BEFORE SHEAR	SATURATION, %		s_c				
BEFORE SHEAR	VOID RATIO		e_c				
BEFORE SHEAR	FINAL BACK PRESSURE, T/SQ FT		u_o				
MINOR PRINCIPAL STRESS, T/SQ FT			σ_3	0.5	1.5	3.0	
MAXIMUM DEVIATOR STRESS, T/SQ FT		$(\sigma_1 - \sigma_3)_{MAX}$		0.72	0.74	0.80	
TIME TO $(\sigma_1 - \sigma_3)_{MAX}$, MIN			t_f	9	13	23	
ULTIMATE DEVIATOR STRESS, T/SQ FT		$(\sigma_1 - \sigma_3)_{ULT}$					
INITIAL DIAMETER, IN.			D_o	1.40	1.40	1.40	
INITIAL HEIGHT, IN.			H_o	3.00	3.00	3.00	

CONTROLLED- Strain TEST

DESCRIPTION OF SPECIMENS PLASTIC CLAY(CH),gray

LL 72	PL 23	PI 49	Gs 2.72	TYPE OF SPECIMEN UNDISTURBED	TYPE OF TEST Q

REMARKS: ---- Rate of strain increased

PROJECT LK.PONT.LA.&VIC.-HURR.PROT.-ORLEANS PARISH OUTFALL CANALS, ORLEANS ST. CANAL

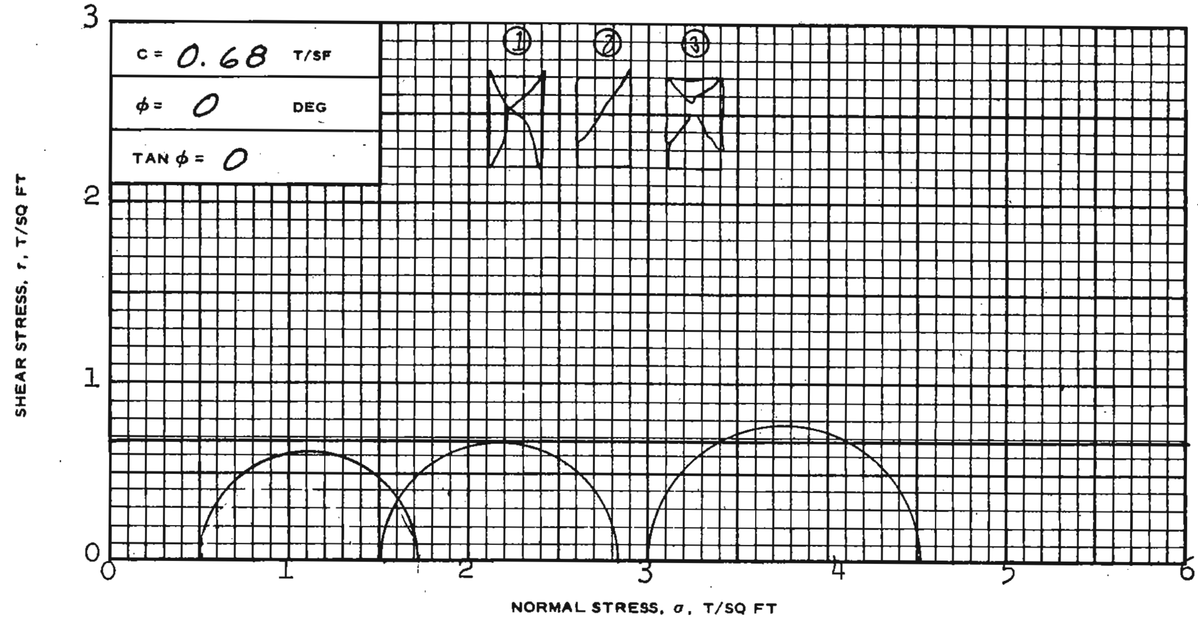
BORING NO. 1-UOP | SAMPLE NO. 15A

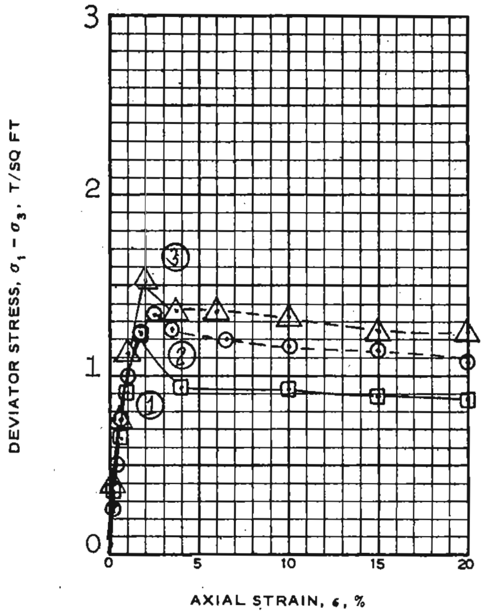
DEPTH/ELEV 55.4/-52.6

LABORATORY USAEWES | DATE 28 August,1973

JMS **TRIAXIAL COMPRESSION TEST REPORT**

ENG FORM NO. 2089 REV JUNE 1970 PREVIOUS EDITION IS OBSOLETE TRANSLUCENT *(EM 1110-2-1906)*





sat. γ = 114.6

SPECIMEN NO.			1	2	3	Avg.
INITIAL	WATER CONTENT, %	w_o	39.5	38.0	38.5	38.7
	DRY DENSITY LB/ CU FT	γd_o	81.1	82.7	82.4	
	SATURATION, %	S_o	97.5	97.3	97.7	
	VOID RATIO	e_o	1.11	1.07	1.08	
BEFORE SHEAR	WATER CONTENT, %	w_c				
	DRY DENSITY LB/CU FT	γd_c				
	SATURATION, %	S_c				
	VOID RATIO	e_c				
	FINAL BACK PRESSURE, T/SQ FT	u_o				
MINOR PRINCIPAL STRESS, T/SQ FT		σ_3	0.5	1.5	3.0	
MAXIMUM DEVIATOR STRESS, T/SQ FT		$(\sigma_1 - \sigma_3)_{MAX}$	1.22	1.34	1.52	
TIME TO $(\sigma_1 - \sigma_3)_{MAX}$, MIN		t_f	70	20	16	
ULTIMATE DEVIATOR STRESS, T/SQ FT		$(\sigma_1 - \sigma_3)_{ULT}$				
INITIAL DIAMETER, IN.		D_o	1.40	1.40	1.40	
INITIAL HEIGHT, IN.		H_o	3.00	3.00	3.00	

CONTROLLED- strain TEST

DESCRIPTION OF SPECIMENS LEAN CLAY(CL),gray;1/8" to 1/4" thick seams of silt

LL 49	PL 21	PI 28	Gs 2.74

TYPE OF SPECIMEN UNDISTURBED | TYPE OF TEST Q

REMARKS: Rate of strain increased.

PROJECT LK.PONT.LA.&VIC.-HURR. PROT-ORLEANS PARISH OUTFALL CANALS-ORLEANS ST.CANAL

BORING NO. 1-UOP | SAMPLE NO. 25-C

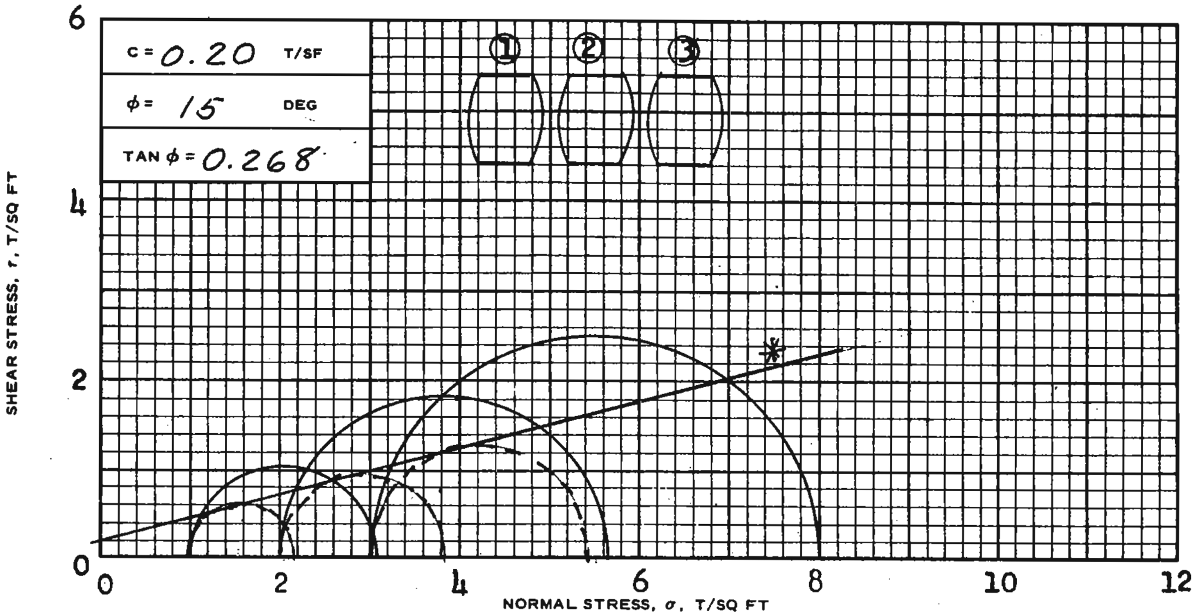
DEPTH/ELEV 96.9/-94.1

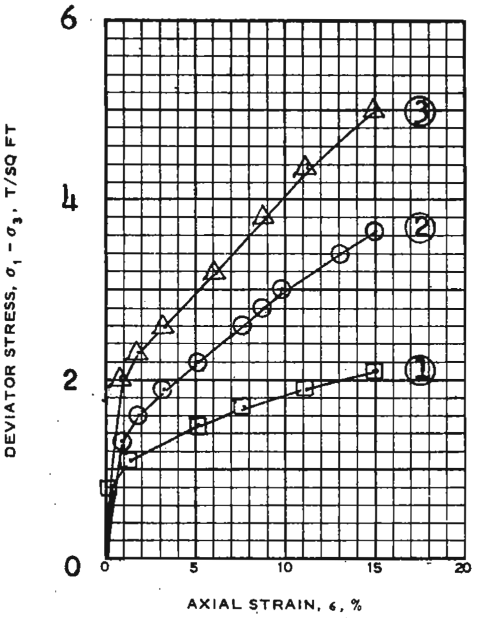
LABORATORY USAEWES | DATE 29 August 1973

JMS

TRIAXIAL COMPRESSION TEST REPORT

ENG FORM NO. 2089 REV JUNE 1970 PREVIOUS EDITION IS OBSOLETE TRANSLUCENT (EM 1110–2–1906)





sat. γ = 115.0

SPECIMEN NO.			1	2	3	Avg.
INITIAL	WATER CONTENT, %	w_o	37.7	36.6	35.9	36.7
	DRY DENSITY LB/CU FT	γd_o	83.0	84.3	85.0	
	SATURATION, %	S_o	100+	100+	100+	
	VOID RATIO	e_o	1.00	0.970	0.953	
BEFORE SHEAR	WATER CONTENT, %	w_c	35.8	34.0	33.0	
	DRY DENSITY LB/CU FT	γd_c	86.0	89.2	90.8	
	SATURATION, %	S_c	100+	100+	100+	
	VOID RATIO	e_c	0.931	0.862	0.829	
	FINAL BACK PRESSURE, T/SQ FT	u_o	4.82	4.82	4.82	
MINOR PRINCIPAL STRESS, T/SQ FT		σ_3	1.0	2.0	3.0	
MAXIMUM DEVIATOR STRESS, T/SQ FT		$(\sigma_1 - \sigma_3)_{MAX}$	2.09	3.65	5.01	
TIME TO $(\sigma_1 - \sigma_3)_{MAX}$, MIN		t_f	62	61	61	
*($\sigma^1 - \sigma^3$) at max. Pore Pressure			1.18	1.82	2.5	
INITIAL DIAMETER, IN.		D_o	1.38	1.38	1.39	
INITIAL HEIGHT, IN.		H_o	3.00	3.00	3.00	

CONTROLLED- Strain TEST

DESCRIPTION OF SPECIMENS SILTY CLAY(CL), gray; numerous shells up to 1"; sand layers

LL 36	PL 16	PI 20	Gs 2.66	TYPE OF SPECIMEN UNDISTURBED	TYPE OF TEST R

REMARKS: See attached plot for effective values
Portion of sample allowed to drain before trimming

PROJECT LK. PONT.,LA.&VIC.-HURR.PROT.,ORLEANS PARISH, OUTFALL CANALS-ORLEANS ST. CANAL

BORING NO. 1-UOP SAMPLE NO. 5-C

DEPTH/ELEV 16.8/-14.0

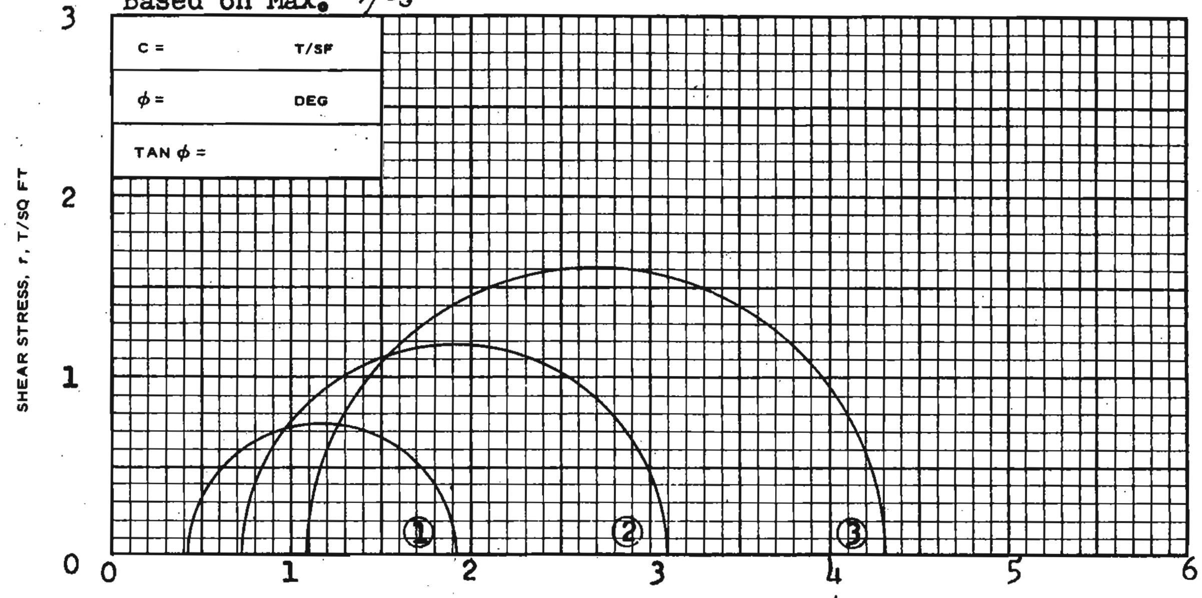
LABORATORY USAEWES DATE 4 August,1973

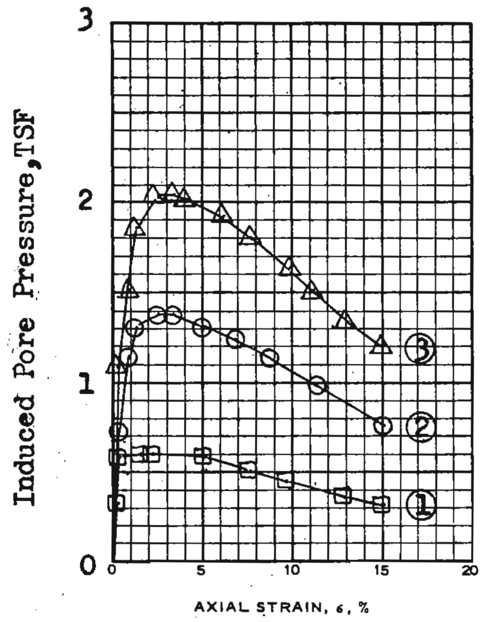
Sheet 1 of 2

TES TRIAXIAL COMPRESSION TEST REPORT

ENG FORM NO. 2089 REV JUNE 1970 PREVIOUS EDITION IS OBSOLETE TRANSLUCENT (EM 1110-2-1906)

Based on Max. σ_1'/σ_3'





SPECIMEN NO.						
INITIAL	WATER CONTENT, %	w_o				
	DRY DENSITY LB/ CU FT	γd_o				
	SATURATION, %	S_o				
	VOID RATIO	e_o				
BEFORE SHEAR	WATER CONTENT, %	w_c				
	DRY DENSITY LB/CU FT	γd_c				
	SATURATION, %	S_c				
	VOID RATIO	e_c				
	FINAL BACK PRESSURE, T/SQ FT	u_o				
MINOR PRINCIPAL STRESS, T/SQ FT		σ_3				
MAXIMUM DEVIATOR STRESS, T/SQ FT		$(\sigma_1 - \sigma_3)_{MAX}$				
TIME TO $(\sigma_1 - \sigma_3)_{MAX}$, MIN		t_f				
ULTIMATE DEVIATOR STRESS, T/SQ FT		$(\sigma_1 - \sigma_3)_{ULT}$				
INITIAL DIAMETER, IN.		D_o				
INITIAL HEIGHT, IN.		H_o				

CONTROLLED- TEST

DESCRIPTION OF SPECIMENS

LL	PL	PI	Gs	TYPE OF SPECIMEN	TYPE OF TEST

REMARKS:

PROJECT LK. PONT., LA.& VIC.-HURR. PROT. ORLEANS PARISH OUTFALL CANALS-ORLEANS ST. CANAL

BORING NO. 1-UOP SAMPLE NO. 5-C

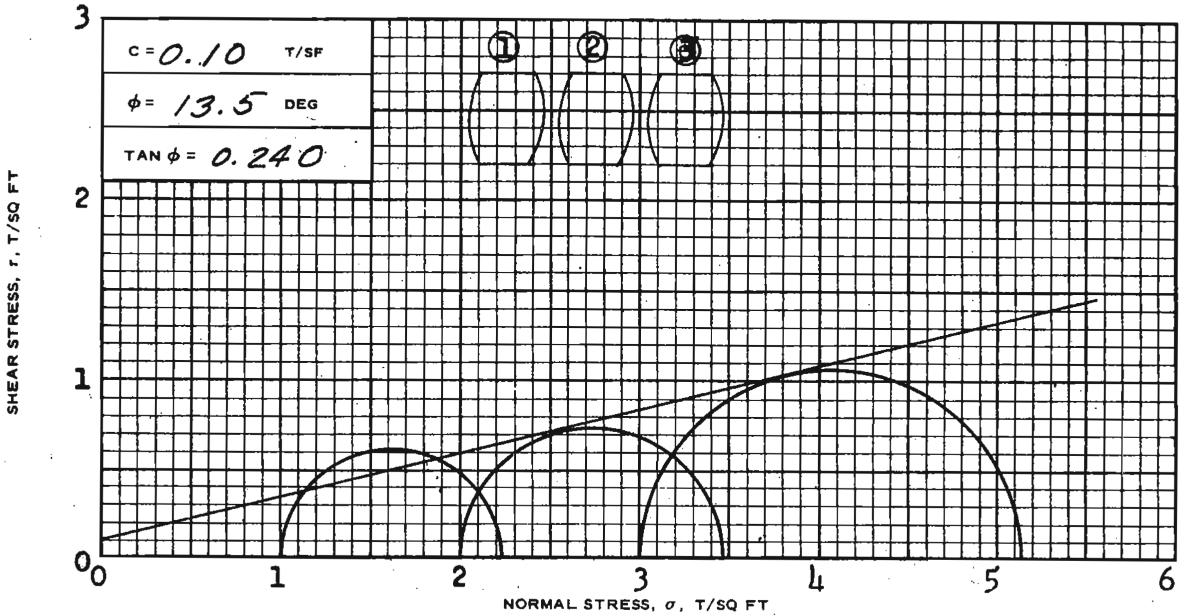
DEPTH/ELEV 16.8/-14.0

LABORATORY USAEWES DATE 4 August, 1973

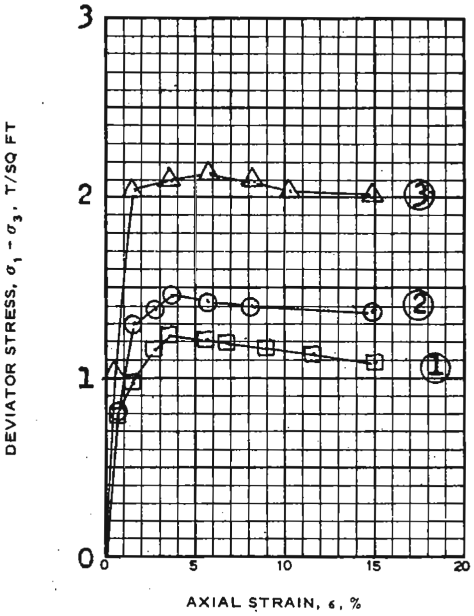
Sheet 2 of 2

TES TRIAXIAL COMPRESSION TEST REPORT

ENG FORM NO. 2089 REV JUNE 1970 PREVIOUS EDITION IS OBSOLETE TRANSLUCENT (EM 1110-2-1906)



sat.γ = 110.5



SPECIMEN NO.		1	2	3	Avg.
INITIAL — WATER CONTENT, %	w_o	43.5	46.6	43.6	44.6
INITIAL — DRY DENSITY LB/ CU FT	γ_{d_o}	77.4	74.6	77.4	
INITIAL — SATURATION, %	S_o	100+	100+	100+	
INITIAL — VOID RATIO	e_o	1.15	1.24	1.15	
BEFORE SHEAR — WATER CONTENT, %	w_c	38.6	37.8	31.2	
BEFORE SHEAR — DRY DENSITY LB/CU FT	γ_{d_c}	81.7	83.1	88.8	
BEFORE SHEAR — SATURATION, %	S_c	99.0	100+	95.0	
BEFORE SHEAR — VOID RATIO	e_c	1.04	1.01	0.877	
BEFORE SHEAR — FINAL BACK PRESSURE, T/SQ FT	u_o	5.54	5.54	5.54	
MINOR PRINCIPAL STRESS, T/SQ FT	σ_3	1.0	2.0	3.0	
MAXIMUM DEVIATOR STRESS, T/SQ FT	$(\sigma_1 - \sigma_3)_{MAX}$	1.23	1.47	2.14	
TIME TO $(\sigma_1 - \sigma_3)_{MAX}$, MIN	t_f	14	14	22	
ULTIMATE DEVIATOR STRESS, T/SQ FT	$(\sigma_1 - \sigma_3)_{ULT}$				
INITIAL DIAMETER, IN.	D_o	1.39	1.39	1.39	
INITIAL HEIGHT, IN.	H_o	3.00	3.00	3.00	

CONTROLLED- Strain TEST

DESCRIPTION OF SPECIMENS CLAYEY SANDY SILT(ML),gray

LL 35	PL 27	PI 8	Gs 2.67	TYPE OF SPECIMEN UNDISTURBED	TYPE OF TEST R

REMARKS: See attached plot for effective values

PROJECT LK.PONT.,LA.&VIC-HURR.PROT.-ORLEANS PARISH OUTFALL CANALS-ORLEANS ST. CANAL

BORING NO. 1-UOP SAMPLE NO. 12-B

DEPTH/~~ELEV~~ 44.0/41.2

LABORATORY USAEWES DATE 4 August,1973

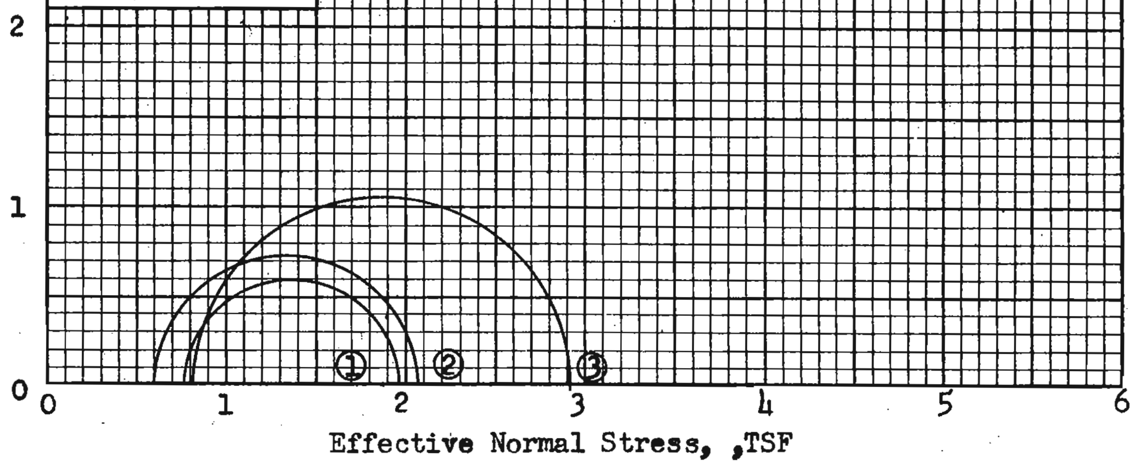
Sheet 1 of 2

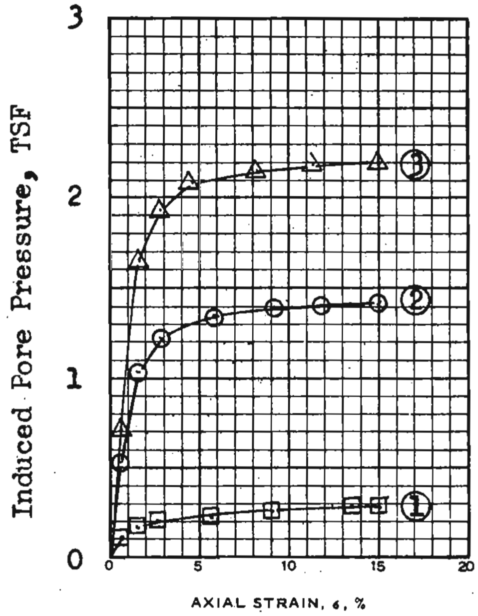
TES TRIAXIAL COMPRESSION TEST REPORT

ENG FORM NO. 2089 REV. JUNE 1970 PREVIOUS EDITION IS OBSOLETE TRANSLUCENT (EM 1110-2-1906)

Based on Max. σ_1'/σ_3'

C =	T/SF
ϕ =	DEG
TAN ϕ =	





SPECIMEN NO.						
INITIAL	WATER CONTENT, %	w_o				
	DRY DENSITY LB/ CU FT	γd_o				
	SATURATION, %	s_o				
	VOID RATIO	e_o				
BEFORE SHEAR	WATER CONTENT, %	w_c				
	DRY DENSITY LB/CU FT	γd_c				
	SATURATION, %	s_c				
	VOID RATIO	e_c				
	FINAL BACK PRESSURE, T/SQ FT	u_o				
MINOR PRINCIPAL STRESS, T/SQ FT		σ_3				
MAXIMUM DEVIATOR STRESS, T/SQ FT		$(\sigma_1 - \sigma_3)_{MAX}$				
TIME TO $(\sigma_1 - \sigma_3)_{MAX}$, MIN		t_f				
ULTIMATE DEVIATOR STRESS, T/SQ FT		$(\sigma_1 - \sigma_3)_{ULT}$				
INITIAL DIAMETER, IN.		D_o				
INITIAL HEIGHT, IN.		H_o				

CONTROLLED- TEST

DESCRIPTION OF SPECIMENS

LL	PL	PI	Gs	TYPE OF SPECIMEN	TYPE OF TEST

REMARKS:

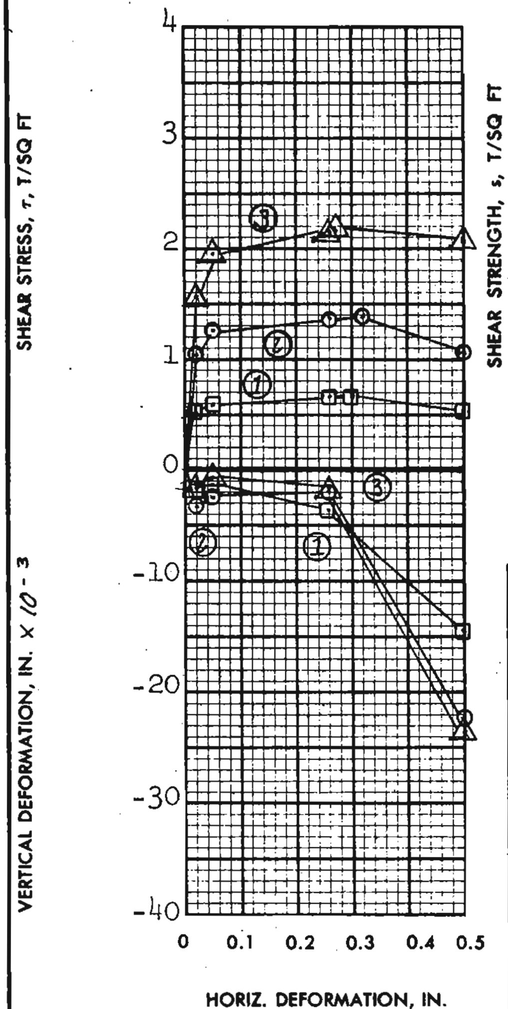
PROJECT LK.PONT.,LA.&VIC.-HURR.PROT.ORLEANS PARISH,OUTFALL CANALS-ORLEANS ST. CANAL

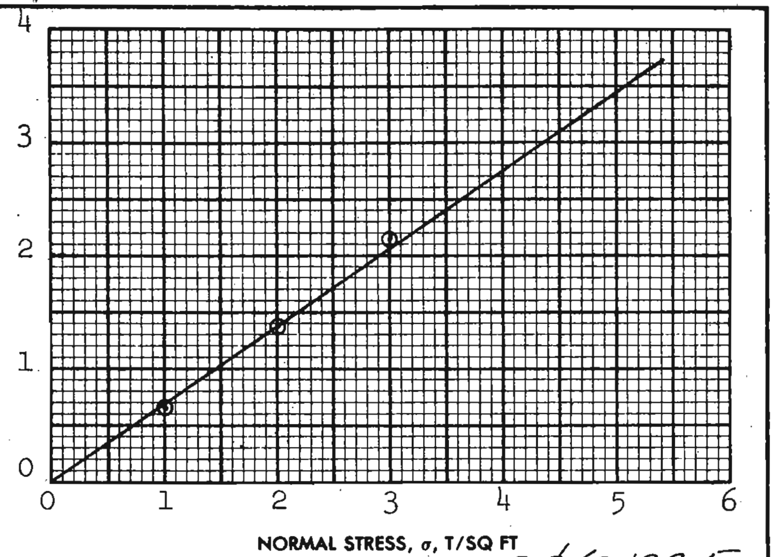
BORING NO. 1-UOP	SAMPLE NO. 12-B
DEPTH ~~ELEV~~ 44.0/41.2	
LABORATORY USAEWES	DATE 4 August 1973

Sheet 2 of 2

TES TRIAXIAL COMPRESSION TEST REPORT

ENG FORM NO. 2089 REV JUNE 1970 PREVIOUS EDITION IS OBSOLETE TRANSLUCENT (EM 1110–2–1906)





Sat. γ = 122.5

TEST NO.			1	2	3	Avg.
INITIAL	WATER CONTENT	w_o	26.1 %	25.9 %	26.2 %	26.1 %
	VOID RATIO	e_o	0.733	0.733	0.740	
	SATURATION	S_o	95.1%	94.3%	94.5 %	%
	DRY DENSITY, LB/CU FT	γ_d	96.2	96.2	95.8	
VOID RATIO AFTER CONSOLIDATION		e_c				
TIME FOR 50 PERCENT CONSOLIDATION, MIN		t_{50}				
FINAL	WATER CONTENT	w_f	23.0%	23.4%	24.3 %	%
	VOID RATIO	e_f				
	SATURATION	S_f	%	%	%	%
NORMAL STRESS, T/SQ FT		σ	1.0	2.0	3.0	
MAXIMUM SHEAR STRESS, T/SQ FT		τ_{max}	0.67	1.39	2.15	
ACTUAL TIME TO FAILURE, MIN		t_f	1560	1680	1380	
RATE OF STRAIN, IN./MIN			.00019	.00019	.00019	
ULTIMATE SHEAR STRESS, T/SQ FT		τ_{ult}				

SHEAR STRENGTH PARAMETERS

ϕ' = 34°

TAN ϕ' = 0.674

c' = 0 T/SQ FT

☐ CONTROLLED STRESS

☒ CONTROLLED STRAIN

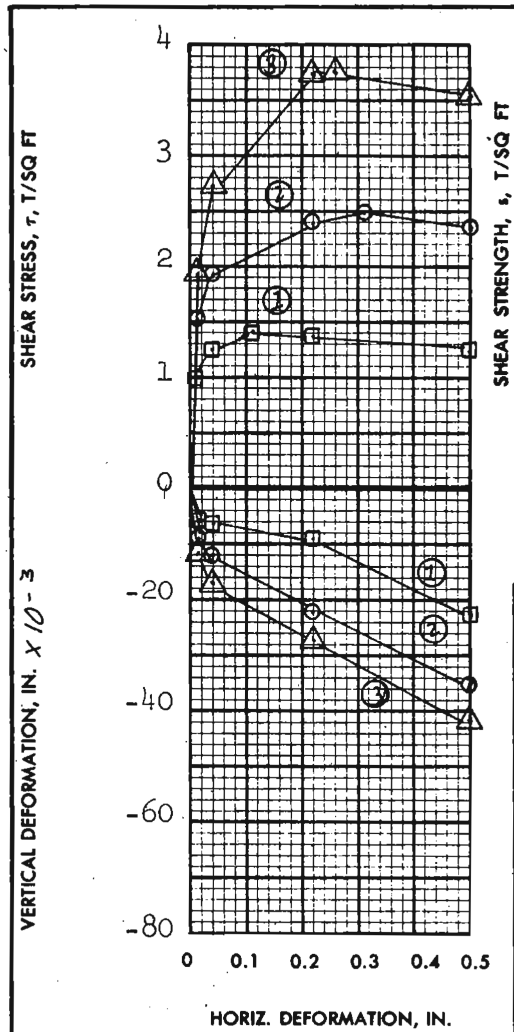
TYPE OF SPECIMEN	UNDISTURBED	3.00 IN. SQUARE	0.620 IN. THICK	
CLASSIFICATION	SILTY SAND(SM),gray;shells approx. 1/16" diam			
LL -	PL -	PI -		G_s 2.67

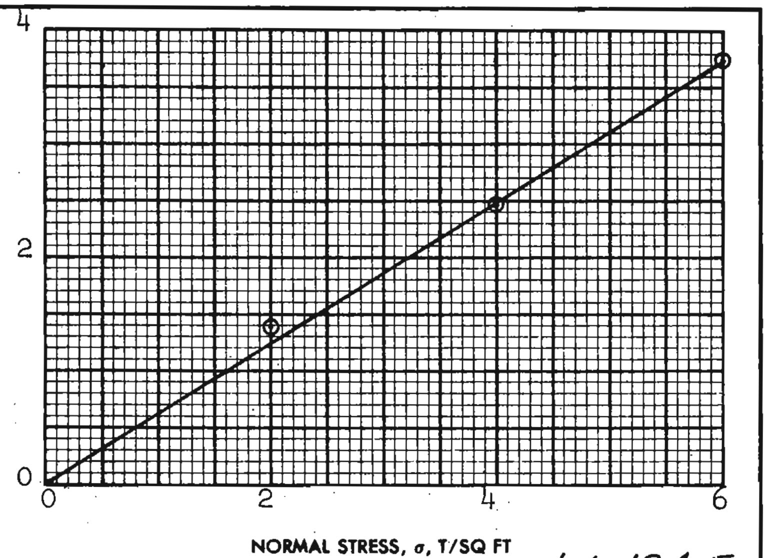
REMARKS

PROJECT	LK.PONT.LA.&VIC-HURR. PROT-ORLEANS PARISH OUTFALL CANALS-ORLEANS ST. CANAL
AREA	
BORING NO. 1-UOP	SAMPLE NO. 10-C
DEPTH EL 36.4/-33.6	DATE 4 Sept. 1973

RCH

DIRECT SHEAR TEST REPORT





sat γ = 124.5

SHEAR STRENGTH PARAMETERS

ϕ' = 32°

TAN ϕ' = 0.625

c' = 0 T/SQ FT

☐ CONTROLLED STRESS

☒ CONTROLLED STRAIN

TEST NO.			1	2	3	Avg.
INITIAL	WATER CONTENT	w_o	24.8 %	25.1 %	25.1 %	25.0%
INITIAL	VOID RATIO	e_o	0.703	0.713	0.711	
INITIAL	SATURATION	S_o	95.2 %	95.0 %	95.3 %	%
INITIAL	DRY DENSITY, LB/CU FT	γ_d	99.0	98.4	98.5	
VOID RATIO AFTER CONSOLIDATION		e_c				
TIME FOR 50 PERCENT CONSOLIDATION, MIN		t_{50}	23.3	23.6	21.9	
FINAL	WATER CONTENT	w_f	%	%	%	%
FINAL	VOID RATIO	e_f				
FINAL	SATURATION	S_f	%	%	%	%
NORMAL STRESS, T/SQ FT		σ	2.0	4.0	6.0	
MAXIMUM SHEAR STRESS, T/SQ FT		τ_{max}	1.40	2.49	3.74	
ACTUAL TIME TO FAILURE, MIN		t_f	660	1800	1500	
RATE OF STRAIN, IN./MIN			.00018	.00018	.00018	
ULTIMATE SHEAR STRESS, T/SQ FT		τ_{ult}				

TYPE OF SPECIMEN UNDISTURBED	3.01 IN. SQUARE	0.620 IN. THICK	
CLASSIFICATION SILTY SAND(SM), tannish gray			
LL –	PL –	PI –	G_s 2.70

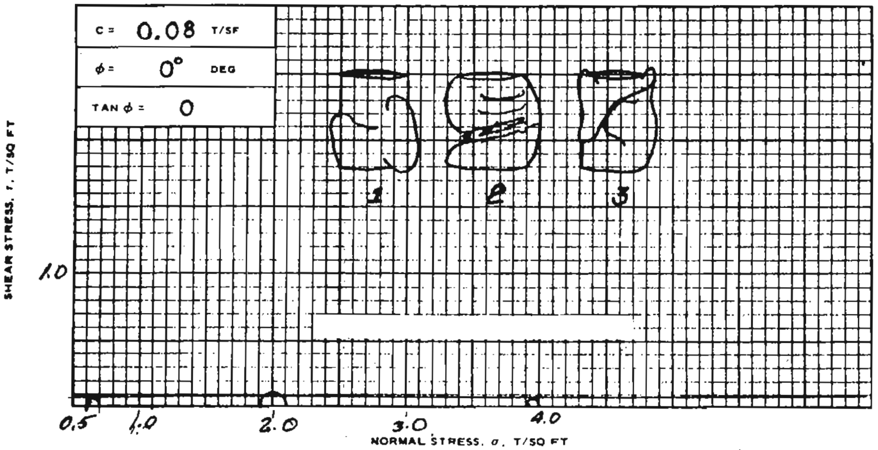
REMARKS

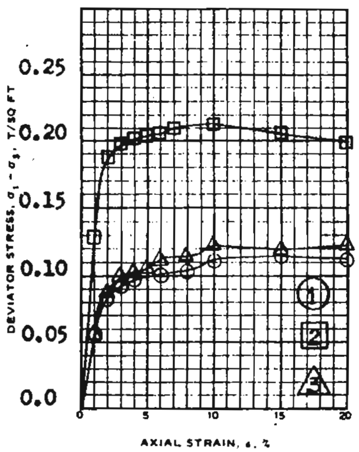
PROJECT LK. PONT. LA.&VIC-HURR. PROT-ORLEANS PARISH OUTFALL CANALS-ORLEANS ST. CANAL

AREA

BORING NO. 1-UOP	SAMPLE NO. 17-C
DEPTH / EL 64.6/-61.8	DATE 5 Sept. 1973

RCH **DIRECT SHEAR TEST REPORT**





γsat = 107

SPECIMEN NO.			1	2	3	Avg.
INITIAL	WATER CONTENT, %	w_o	49.20	48.19	56.31	51.2
	DRY DENSITY LB/CU FT	γ_{d_o}	71.08	72.90	66.20	
	SATURATION, %	S_o	96.84	99.12	98.31	
	VOID RATIO	e_o	1.374	1.314	1.549	
BEFORE SHEAR	WATER CONTENT, %	w_c				
	DRY DENSITY LB/CU FT	γ_{d_c}				
	SATURATION, %	S_c				
	VOID RATIO	e_c				
	FINAL BACK PRESSURE, T/SQ FT	u_o				
MINOR PRINCIPAL STRESS, T/SQ FT		σ_3	0.6	1.9	3.9	
MAXIMUM DEVIATOR STRESS, T/SQ FT		$(\sigma_1 - \sigma_3)_{max}$	0.115	0.214	0.122	
TIME TO $(\sigma_1 - \sigma_3)_{max}$, MIN		t_f	23.76	15.84	15.91	
ULTIMATE DEVIATOR STRESS, T/SQ FT		$(\sigma_1 - \sigma_3)_{ult}$				
INITIAL DIAMETER, IN.		D_o	1.4	1.4	1.4	
INITIAL HEIGHT, IN.		H_o	3.0	3.0	3.0	

CONTROLLED- STRAIN TEST

DESCRIPTION OF SPECIMENS vSo (Gr) CH2: few lns ML; spks dw; slurry

LL 51	PL 18	PI 33	Gs 2.7034	TYPE OF SPECIMEN 5" Undis.	TYPE OF TEST "Q"

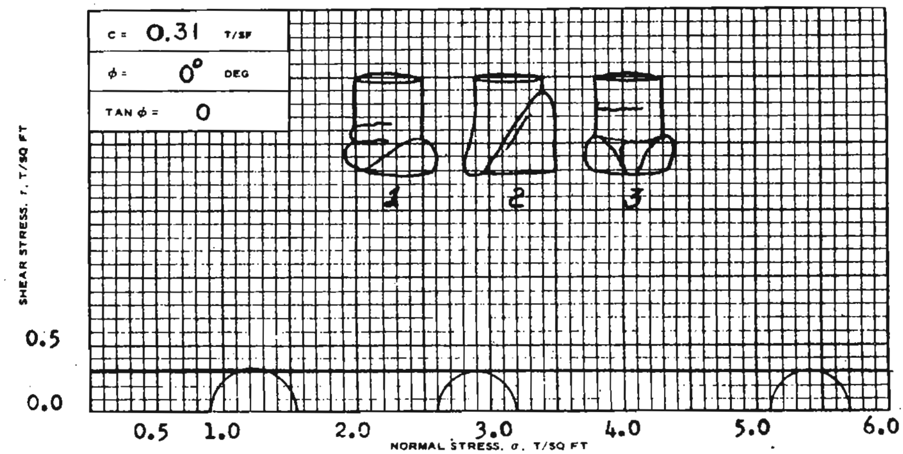
REMARKS:

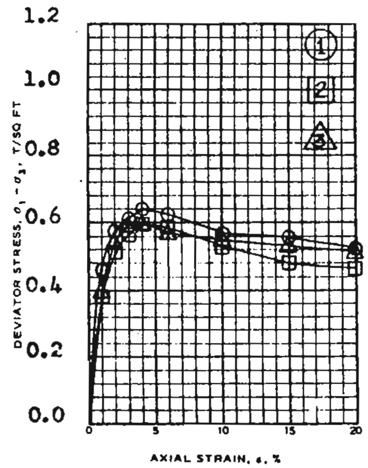
PROJECT Lk. Pont. La. & Vic.-Orleans Parish Lakefront Levees, West of IHNC

BORING NO. 5-ULO	SAMPLE NO. 7-C
DEPTH/ELEV 25.3 / -12.9	
LABORATORY NOD	DATE 8 June 73

TRIAXIAL COMPRESSION TEST REPORT

ENG FORM NO. 2089 REV JUNE 1970 PREVIOUS EDITION IS OBSOLETE TRANSLUCENT





γsat = 102

SPECIMEN NO.			1	2	3	Avg.
INITIAL	WATER CONTENT, %	w_o	60.72	60.78	59.56	60.4
	DRY DENSITY LB/CU FT	γ_{d_o}	63.37	63.47	64.23	
	SATURATION, %	S_o	98.83	99.18	99.07	
	VOID RATIO	e_o	1.659	1.655	1.623	
BEFORE SHEAR	WATER CONTENT, %	w_c				
	DRY DENSITY LB/CU FT	γ_{d_c}				
	SATURATION, %	S_c				
	VOID RATIO	e_c				
	FINAL BACK PRESSURE, T/SQ FT	u_o				
MINOR PRINCIPAL STRESS, T/SQ FT		σ_3	0.9	2.6	5.1	
MAXIMUM DEVIATOR STRESS, T/SQ FT		$(\sigma_1 - \sigma_3)_{max}$	0.641	0.597	0.597	
TIME TO $(\sigma_1 - \sigma_3)_{max}$, MIN		t_f	6.36	14.22	14.04	
ULTIMATE DEVIATOR STRESS, T/SQ FT		$(\sigma_1 - \sigma_3)_{ult}$				
INITIAL DIAMETER, IN.		D_o	1.4	1.4	1.4	
INITIAL HEIGHT, IN.		H_o	3.0	3.0	3.0	

CONTROLLED- STRAIN TEST

DESCRIPTION OF SPECIMENS So (Gr) CH3: lns & thin lys SM; org strks.

LL 70	PL 22	PI 48	Gs 2.6998	TYPE OF SPECIMEN 5" Undis.	TYPE OF TEST "Q"

REMARKS:

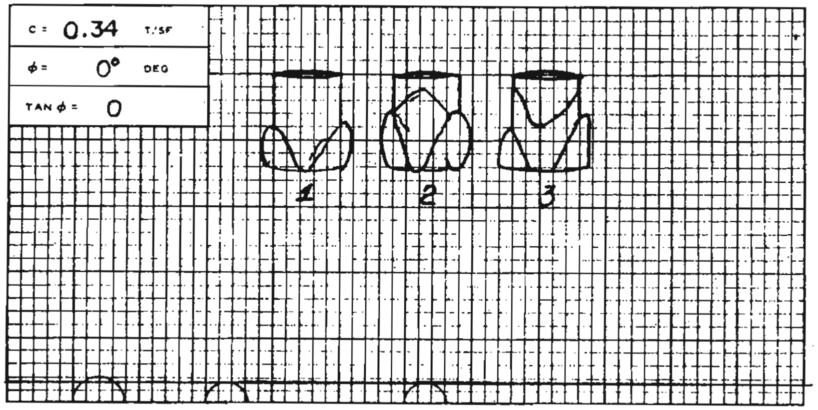
PROJECT Lk. Pont. La. & Vic.-Orleans Parish Lakefront Levees - West of IHNC

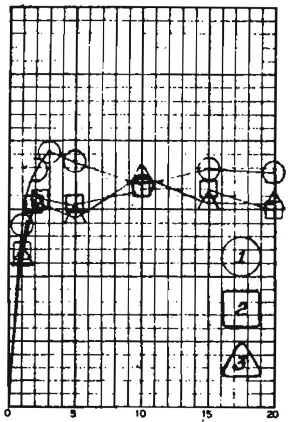
BORING NO. 5-ULO	SAMPLE NO. 10-B
DEPTH/ELEV 36.4 / -24.0	
LABORATORY NOD	DATE 8 June 73

TRIAXIAL COMPRESSION TEST REPORT

ENG FORM NO. 2089 REV JUNE 1970 PREVIOUS EDITION IS OBSOLETE TRANSLUCENT

C =	0.34	T/SF
φ =	0°	DEG
TAN φ =	0	





γsat = 99

SPECIMEN NO			1	2	3	Avg.
INITIAL	WATER CONTENT, %	w_o	69.40	70.63	71.21	70.4
	DRY DENSITY LB/CU FT	γd_o	58.47	57.72	57.37	
	SATURATION, %	S_o	99.56	99.35	99.26	
	VOID RATIO	e_o	1.882	1.920	1.937	
BEFORE SHEAR	WATER CONTENT, %	w_c				
	DRY DENSITY LB/CU FT	γd_c				
	SATURATION, %	S_c				
	VOID RATIO	e_c				
	FINAL BACK PRESSURE, T/SQ FT	u_o				
MINOR PRINCIPAL STRESS, T/SQ FT		σ_3	1.0	3.0	6.0	
MAXIMUM DEVIATOR STRESS, T/SQ FT		$(\sigma_1 - \sigma_3)_{max}$	0.768	0.634	0.623	
TIME TO $(\sigma_1 - \sigma_3)_{max}$, MIN		t_f	4.67	7.90	6.96	
ULTIMATE DEVIATOR STRESS, T/SQ FT		$(\sigma_1 - \sigma_3)_{ult}$				
INITIAL DIAMETER, IN.		D_o	1.4	1.4	1.4	
INITIAL HEIGHT, IN.		H_o	3.0	3.0	3.0	

CONTROLLED- STRAIN TEST

DESCRIPTION OF SPECIMENS M (Gr) CH4: Few thin lys. ML; spks dw; org strks.

LL 94	PL 26	PI 68	G 2.7007	TYPE OF SPECIMEN 5" Undis.	TYPE OF TEST "Q"

REMARKS:

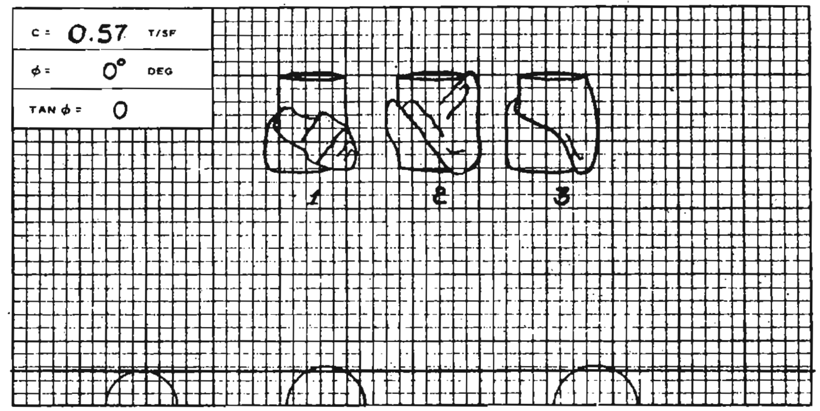
PROJECT Lk. Pont. La. & Vic.-Orleans Parish
Lakefront Levees - West of IHNC

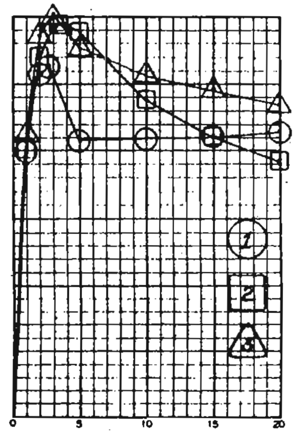
BORING NO.	5-ULO	SAMPLE NO.	11-D
DEPTH/ELEV	42.1 / -29.7		
LABORATORY	NOD	DATE	11 June 73

RJW. TRIAXIAL COMPRESSION TEST REPORT

ENG FORM NO. 2089 REV JUNE 1970 PREVIOUS EDITION IS OBSOLETE TRANSLUCENT

C =	0.57	T/SF
φ =	0°	DEG
TAN φ =	0	





γsat = 104

90

SPECIMEN NO.			1	2	3	Avg.
INITIAL	WATER CONTENT, %	w_o	58.39	55.79	53.38	55.9
	DRY DENSITY LB/CU FT	γd_o	63.84	65.84	67.05	
	SATURATION, %	S_o	96.51	96.98	95.64	
	VOID RATIO	e_o	1.624	1.544	1.498	
BEFORE SHEAR	WATER CONTENT, %	w_c				
	DRY DENSITY LB/CU FT	γd_c				
	SATURATION, %	S_c				
	VOID RATIO	e_c				
	FINAL BACK PRESSURE, T/SQ FT	u_o				
MINOR PRINCIPAL STRESS, T/SQ FT		σ_3	1.4	4.1	8.1	
MAXIMUM DEVIATOR STRESS, T SQ FT		$(\sigma_1 - \sigma_3)_{max}$	1.059	1.181	1.207	
TIME TO $(\sigma_1 - \sigma_3)_{max}$, MIN		t_f	4.33	12.09	10.57	
ULTIMATE DEVIATOR STRESS, T/SQ FT		$(\sigma_1 - \sigma_3)_{ult}$				
INITIAL DIAMETER, IN.		D_o	1.4	1.4	1.4	
INITIAL HEIGHT, IN.		H_o	3.0	3.0	3.0	

CONTROLLED- STRAIN TEST

DESCRIPTION OF SPECIMENS M (gnGr) CH3: lns & ars SP; sl & slf.

LL 75	PL 21	PI 54	G 2.6845	TYPE OF SPECIMEN 5" Undis.	TYPE OF TEST "Q"

REMARKS:

PROJECT Lk. Pont. La. & Vic.-Orleans Parish
Lakefront Levees - West of IHNC

BORING NO.	5-ULO	SAMPLE NO.	16-C
DEPTH/ELEV	61.3 / -48.9		
LABORATORY	NOD	DATE	11June 73

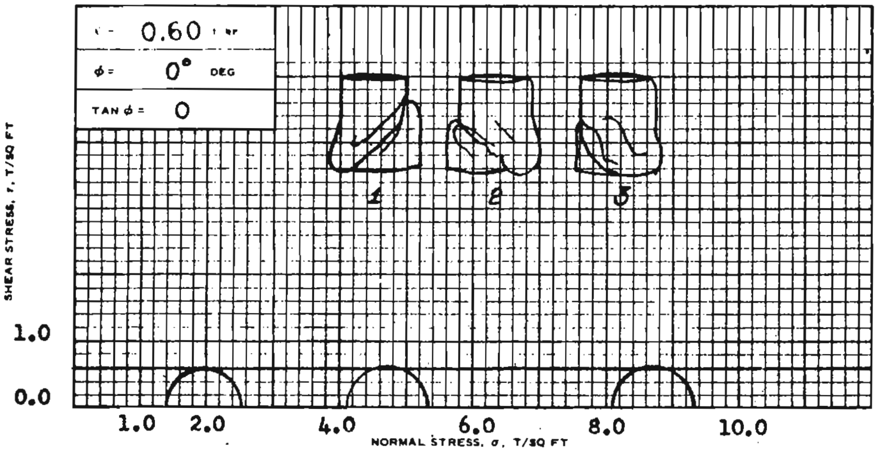
RJW. TRIAXIAL COMPRESSION TEST REPORT

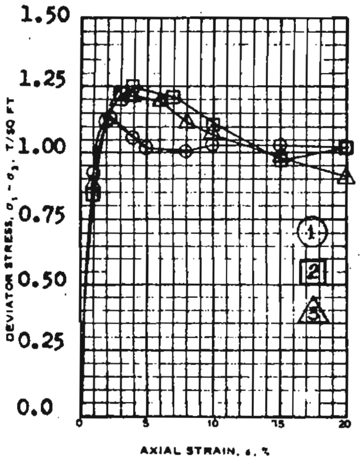
ENG FORM NO. 2089 REV JUNE 1970 PREVIOUS EDITION IS OBSOLETE TRANSLUCENT

c = 0.60 T/SF

φ = 0° DEG

TAN φ = 0





γsat = 108

			SPECIMEN NO.	1	2	3	Avg.
INITIAL	WATER CONTENT, %	w_o	47.00	50.32	49.54	49.0
	DRY DENSITY LB/CU FT	γ_{d_o}	73.72	70.87	71.49	
	SATURATION, %	S_o	98.72	98.64	98.58	
	VOID RATIO	e_o	1.285	1.377	1.357	
BEFORE SHEAR	WATER CONTENT, %	w_c				
	DRY DENSITY LB/CU FT	γ_{d_c}				
	SATURATION, %	S_c				
	VOID RATIO	e_c				
	FINAL BACK PRESSURE, T/SQ FT	u_o				
MINOR PRINCIPAL STRESS, T/SQ FT		σ_3	1.4	4.1	8.1	
MAXIMUM DEVIATOR STRESS, T/SQ FT		$(\sigma_1 - \sigma_3)_{max}$	1.133	1.249	1.221	
TIME TO $(\sigma_1 - \sigma_3)_{max}$, MIN		t_f	2.54	13.39	14.10	
ULTIMATE DEVIATOR STRESS, T/SQ FT		$(\sigma_1 - \sigma_3)_{ult}$				
INITIAL DIAMETER, IN.		D_o	1.4	1.4	1.4	
INITIAL HEIGHT, IN.		H_o	3.0	3.0	3.0	

CONTROLLED- STRAIN TEST

DESCRIPTION OF SPECIMENS St (gnGr) CH4: lns SP; slf

LL 76 | PL 20 | PI 56 | Gs 2.6999 | TYPE OF SPECIMEN 5" Undis. | TYPE OF TEST "Q"

REMARKS:

wB

PROJECT Lk. Pont. La. & Vic .-Orleans Parish Lakefront Levees - West of IHNC

BORING NO. 5-ULO | SAMPLE NO. 17-B

DEPTH/ELEV 64.3 / -51.9

LABORATORY NOD | DATE 12 June 73

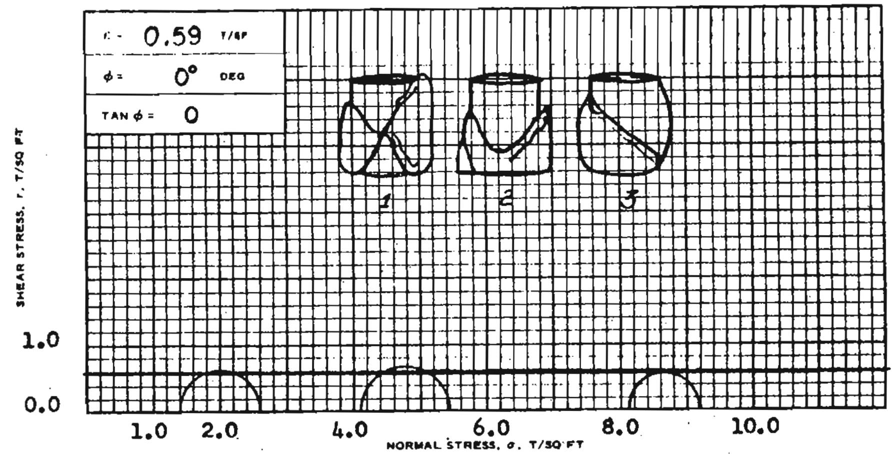
TBW TRIAXIAL COMPRESSION TEST REPORT

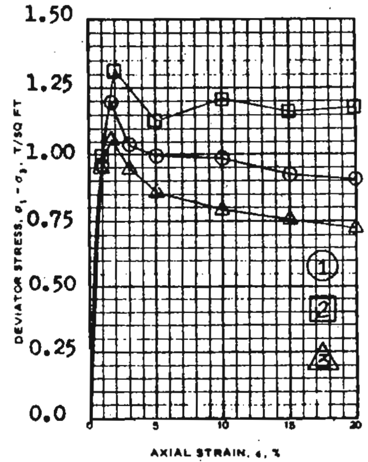
ENG FORM NO. 2089 REV JUNE 1970 PREVIOUS EDITION IS OBSOLETE TRANSLUCENT

c = 0.59 T/SF

φ = 0° DEG

TAN φ = 0





γsat = 111

			SPECIMEN NO.	1	2	3	Avg.
INITIAL	WATER CONTENT, %	w_o	44.64	43.92	43.97	44.2
	DRY DENSITY LB/CU FT	γ_{d_o}	75.74	76.88	76.91	
	SATURATION, %	S_o	98.49	99.60	99.78	
	VOID RATIO	e_o	1.223	1.190	1.189	
BEFORE SHEAR	WATER CONTENT, %	w_c				
	DRY DENSITY LB/CU FT	γ_{d_c}				
	SATURATION, %	S_c				
	VOID RATIO	e_c				
	FINAL BACK PRESSURE, T/SQ FT	u_o				
MINOR PRINCIPAL STRESS, T/SQ FT		σ_3	1.4	4.1	8.1	
MAXIMUM DEVIATOR STRESS, T/SQ FT		$(\sigma_1 - \sigma_3)_{max}$	1.194	1.316	1.055	
TIME TO $(\sigma_1 - \sigma_3)_{max}$, MIN		t_f	2.89	7.11	6.29	
ULTIMATE DEVIATOR STRESS, T/SQ FT		$(\sigma_1 - \sigma_3)_{ult}$				
INITIAL DIAMETER, IN.		D_o	1.4	1.4	1.4	
INITIAL HEIGHT, IN.		H_o	3.0	3.0	3.0	

CONTROLLED- STRAIN TEST

DESCRIPTION OF SPECIMENS St (Gr) CH3: lns & lys ML; spks dw; org strks.

LL 65 | PL 19 | PI 46 | Gs 2.6977 | TYPE OF SPECIMEN 5" Undis. | TYPE OF TEST "Q"

REMARKS:

wB

PROJECT Lk. Pont. La. & Vic.-Orleans Parish Lakefront Levees - West of IHNC

BORING NO. 5-ULO | SAMPLE NO. 25-C

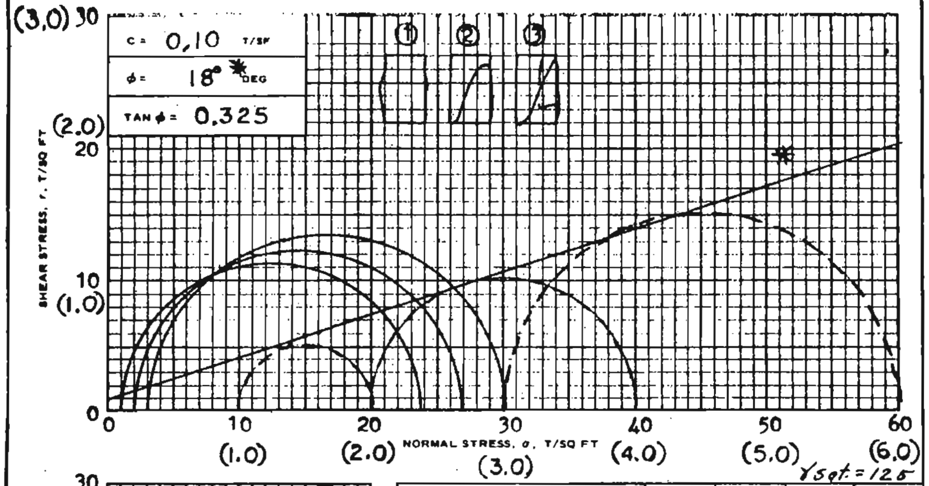
DEPTH/ELEV 97.1 / -84.7

LABORATORY NOD | DATE 12 June 73

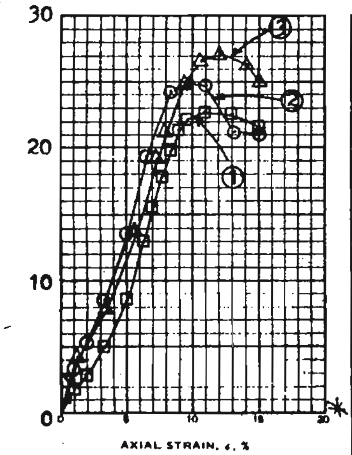
TBW TRIAXIAL COMPRESSION TEST REPORT

ENG FORM NO. 2089 REV JUNE 1970 PREVIOUS EDITION IS OBSOLETE TRANSLUCENT

(3.0)



γsat = 125



SPECIMEN NO.			1	2	3	Avg.
INITIAL	WATER CONTENT, %	w_o	25.2	24.9	24.7	24.9
	DRY DENSITY LB/CU FT	γ_{d_o}	98.8	99.2	99.4	
	SATURATION, %	S_o	97.5	97.2	96.8	
	VOID RATIO	e_o	0.693	0.687	0.684	
BEFORE SHEAR	WATER CONTENT, %	w_c	26.0	25.4	25.4	
	DRY DENSITY LB/CU FT	γ_{d_c}	99.6	100.7	101.3	
	SATURATION, %	S_c	100+	100+	100+	
	VOID RATIO	e_c	0.679	0.661	0.651	
	FINAL BACK PRESSURE, T/SQ FT	u_o	4.32	4.32	4.32	
MINOR PRINCIPAL STRESS, T/SQ FT		σ_3	1.0	2.0	3.0	
MAXIMUM DEVIATOR STRESS, T/SQ FT		$(\sigma_1 - \sigma_3)_{max}$	22.77	24.87	27.23	
TIME TO $(\sigma_1 - \sigma_3)_{max}$, MIN		t_f	95	38	36	
*$(\sigma_1 - \sigma_3)$ AT MAX. PORE PRESSURE			1.0	2.0	3.0	
INITIAL DIAMETER, IN.		D_o	1.40	1.41	1.41	
INITIAL HEIGHT, IN.		H_o	3.00	3.00	3.00	

CONTROLLED- Strain TEST

DESCRIPTION OF SPECIMENS SILTY SAND(SM),tan

LL —	PL —	PI —	Gs 2.68	TYPE OF SPECIMEN UNDISTURBED	TYPE OF TEST R

REMARKS: See attached plot for effective values
Portion of sample allowed to drain before trimming

PROJECT LK.PONT.,LA.& VIC-ORLEANS PARISH LK. FRONT LEVEES,WEST OF IHNC,GDM #2,SUPP. #5

BORING NO. 5-ULO SAMPLE NO. 21-B

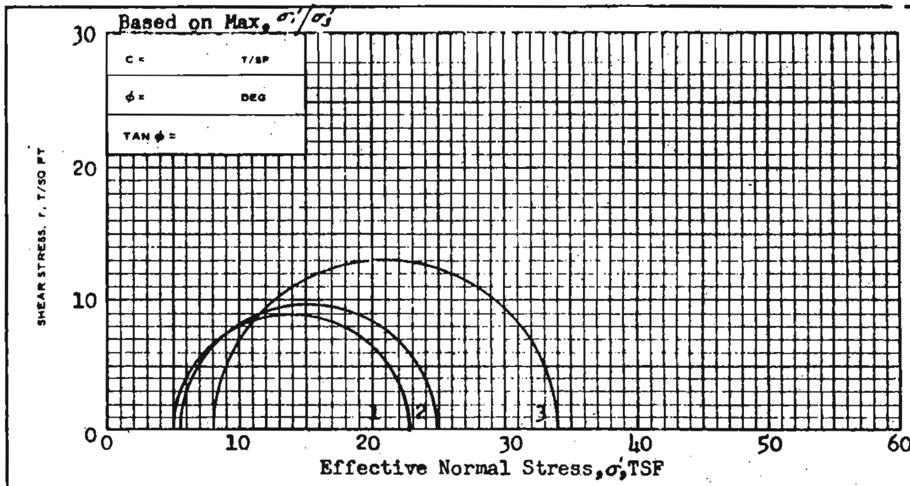
~~DEPTH~~/ELEV -65.5

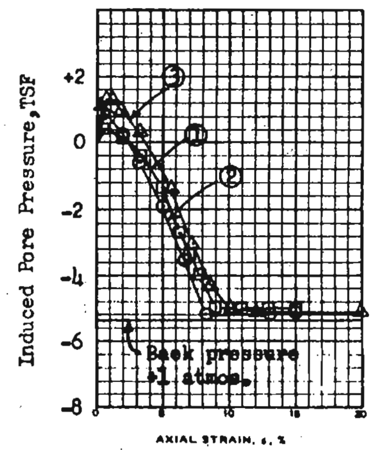
LABORATORY USAEWES DATE 27 Oct.,1972

Sheet 1 of 2

PJR TRIAXIAL COMPRESSION TEST REPORT

ENG FORM NO. 2089 REV JUNE 1970 PREVIOUS EDITION IS OBSOLETE TRANSLUCENT (EM 1110-2-1906)





SPECIMEN NO.						
INITIAL	WATER CONTENT, %	w_o				
	DRY DENSITY LB/CU FT	γ_{d_o}				
	SATURATION, %	S_o				
	VOID RATIO	e_o				
BEFORE SHEAR	WATER CONTENT, %	w_c				
	DRY DENSITY LB/CU FT	γ_{d_c}				
	SATURATION, %	S_c				
	VOID RATIO	e_c				
	FINAL BACK PRESSURE, T/SQ FT	u_o				
MINOR PRINCIPAL STRESS, T/SQ FT		σ_3				
MAXIMUM DEVIATOR STRESS, T/SQ FT		$(\sigma_1 - \sigma_3)_{max}$				
TIME TO $(\sigma_1 - \sigma_3)_{max}$, MIN		t_f				
ULTIMATE DEVIATOR STRESS, T/SQ FT		$(\sigma_1 - \sigma_3)_{ult}$				
INITIAL DIAMETER, IN.		D_o				
INITIAL HEIGHT, IN.		H_o				

CONTROLLED- TEST

DESCRIPTION OF SPECIMENS

LL	PL	PI	Gs	TYPE OF SPECIMEN	TYPE OF TEST R

REMARKS:

PROJECT LK.PONT.,LA.& VIC.-ORLEANS PARISH LK. FRONT LEVEES, WEST OF IHNC,GDM #2,SUPP. #5

BORING NO. 5-ULO SAMPLE NO. 21-B

~~DEPTH~~/ELEV -65.5

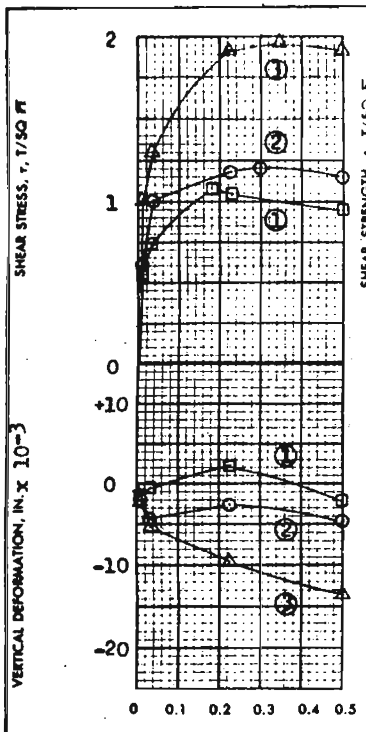
LABORATORY USAEWES DATE 27 Oct.,1972

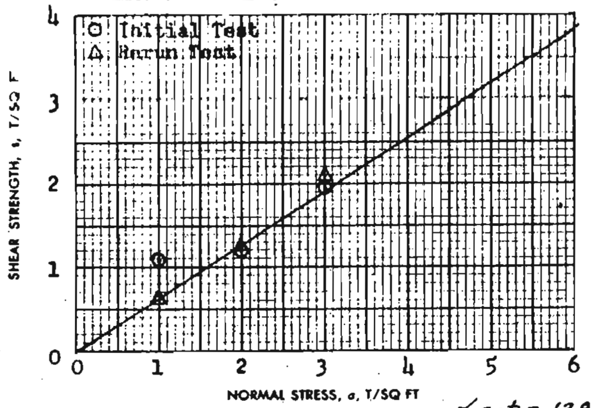
Sheet 2 of 2

PJR TRIAXIAL COMPRESSION TEST REPORT

ENG FORM NO. 2089 REV JUNE 1970 PREVIOUS EDITION IS OBSOLETE TRANSLUCENT (EM 1110-2-1906)

52





γsat. = 128

SHEAR STRENGTH PARAMETERS

φ' = 32°

TAN φ' = 0.635

c' = 0 T/SQ FT

☐ CONTROLLED STRESS

☒ CONTROLLED STRAIN

TEST NO.			1	2	3	Avg.
INITIAL	WATER CONTENT	w_o	29.6 %	27.8%	26.8%	28.1%
	VOID RATIO	e_o	0.729	0.679	0.600	
	SATURATION	S_o	100+ %	100+%	100+ %	%
	DRY DENSITY, LB/CU FT	γ_d	96.4	99.3	104.2	
VOID RATIO AFTER CONSOLIDATION		e_c				
TIME FOR 50 PERCENT CONSOLIDATION, MIN		t_{50}				
FINAL	WATER CONTENT	w_f	23.6 %	25.4%	25.1%	%
	VOID RATIO	e_f				
	SATURATION	S_f	%	%	%	%
NORMAL STRESS, T/SQ FT		σ	1.0	2.0	3.0	
MAXIMUM SHEAR STRESS, T/SQ FT		τ_{max}	1.08	1.20	1.96	
ACTUAL TIME TO FAILURE, MIN		t_f	1020	1620	1860	
RATE OF STRAIN, IN./MIN			.00019	.00019	.00019	
ULTIMATE SHEAR STRESS, T/SQ FT.		τ_{ult}				

TYPE OF SPECIMEN UNDISTURBED — 3.00 IN. SQUARE — 0.538 IN. THICK

CLASSIF. SILTY SAND (SM), gray; shell fragments

LL - PL - PI - G_s 2.67

REMARKS See attached sheet for rerun data

PROJECT LK. PONT., LA. & VIC.-ORLEANS PARISH LK. FRONT LEVEES, WEST OF IHNC, GDM #2, SUPP. #5

AREA

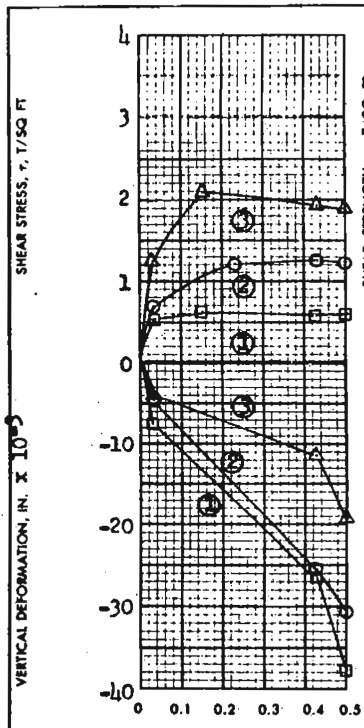
BORING NO. 5-ULO SAMPLE NO. 12-D

DEPTH/EL -33.5 DATE 29 Nov.,1972

Sheet 1 of 2

RCH **DIRECT SHEAR TEST REPORT**

ENG FORM 1 JUN 68 **2092** (EM 1110-2-1906) PREVIOUS EDITIONS ARE OBSOLETE (TRANSLUCENT) PLATE IX-3



SHEAR STRENGTH, s, T/SQ FT

NORMAL STRESS, σ, T/SQ FT

γsat. = 124.3

SHEAR STRENGTH PARAMETERS

φ' =

TAN φ' =

c' = T/SQ FT

☐ CONTROLLED STRESS

☒ CONTROLLED STRAIN

TEST NO.			1	2	3	Avg.
INITIAL	WATER CONTENT	w_o	27.3 %	27.2 %	25.9%	26.8%
	VOID RATIO	e_o	0.680	0.753	0.684	
	SATURATION	S_o	100+ %	96.4 %	100+%	%
	DRY DENSITY, LB/CU FT	γ_d	99.2	95.1	99.0	
VOID RATIO AFTER CONSOLIDATION		e_c				
TIME FOR 50 PERCENT CONSOLIDATION, MIN		t_{50}				
FINAL	WATER CONTENT	w_f	24.0 %	24.9 %	23.3%	%
	VOID RATIO	e_f				
	SATURATION	S_f	%	%	%	%
NORMAL STRESS, T/SQ FT		σ	1.0	2.0	3.0	
MAXIMUM SHEAR STRESS, T/SQ FT		τ_{max}	0.61	1.27	2.09	
ACTUAL TIME TO FAILURE, MIN		t_f	420	1080	420	
RATE OF STRAIN, IN./MIN			.00040	.00040	.00040	
ULTIMATE SHEAR STRESS, T/SQ FT		τ_{ult}				

TYPE OF SPECIMEN UNDISTURBED — 3.00 IN. SQUARE — 0.536 IN. THICK

CLASSIFICATION SILTY SAND (SM), gray; shell fragments

LL - PL - PI - G_s 2.67

REMARKS Rerun test. See sheet 1 for Normal Stress vs Shear Strength plot

PROJECT LK. PONT., LA. & VIC.-ORLEANS PARISH LK. FRONT LEVEES, WEST OF IHNC, GDM #2, SUPP. #5

AREA

BORING NO. 5-ULO SAMPLE NO. 12-D

DEPTH/EL -33.5 DATE 10 Jan.,1973

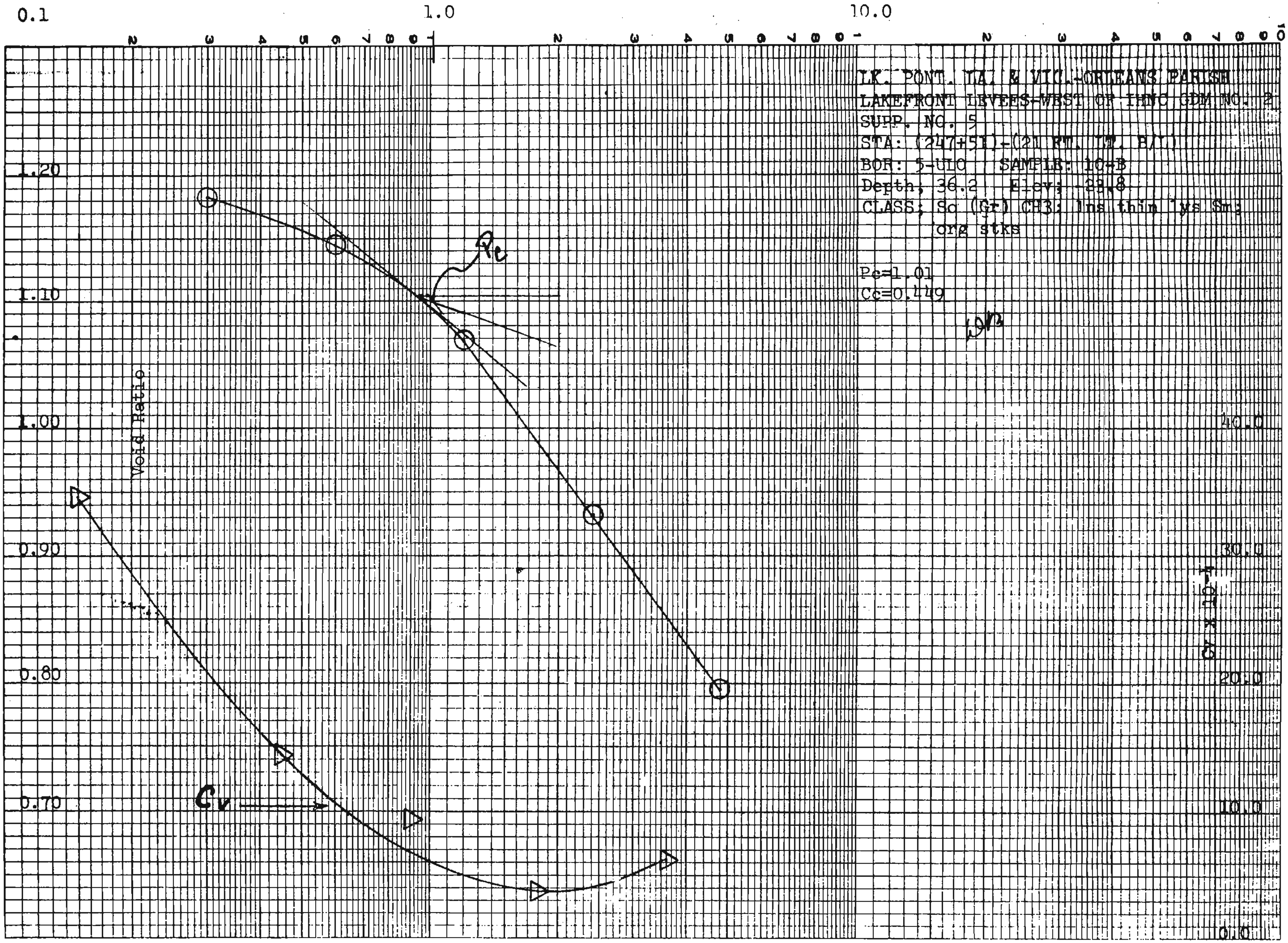
Sheet 2 of 2

RCH **DIRECT SHEAR TEST REPORT**

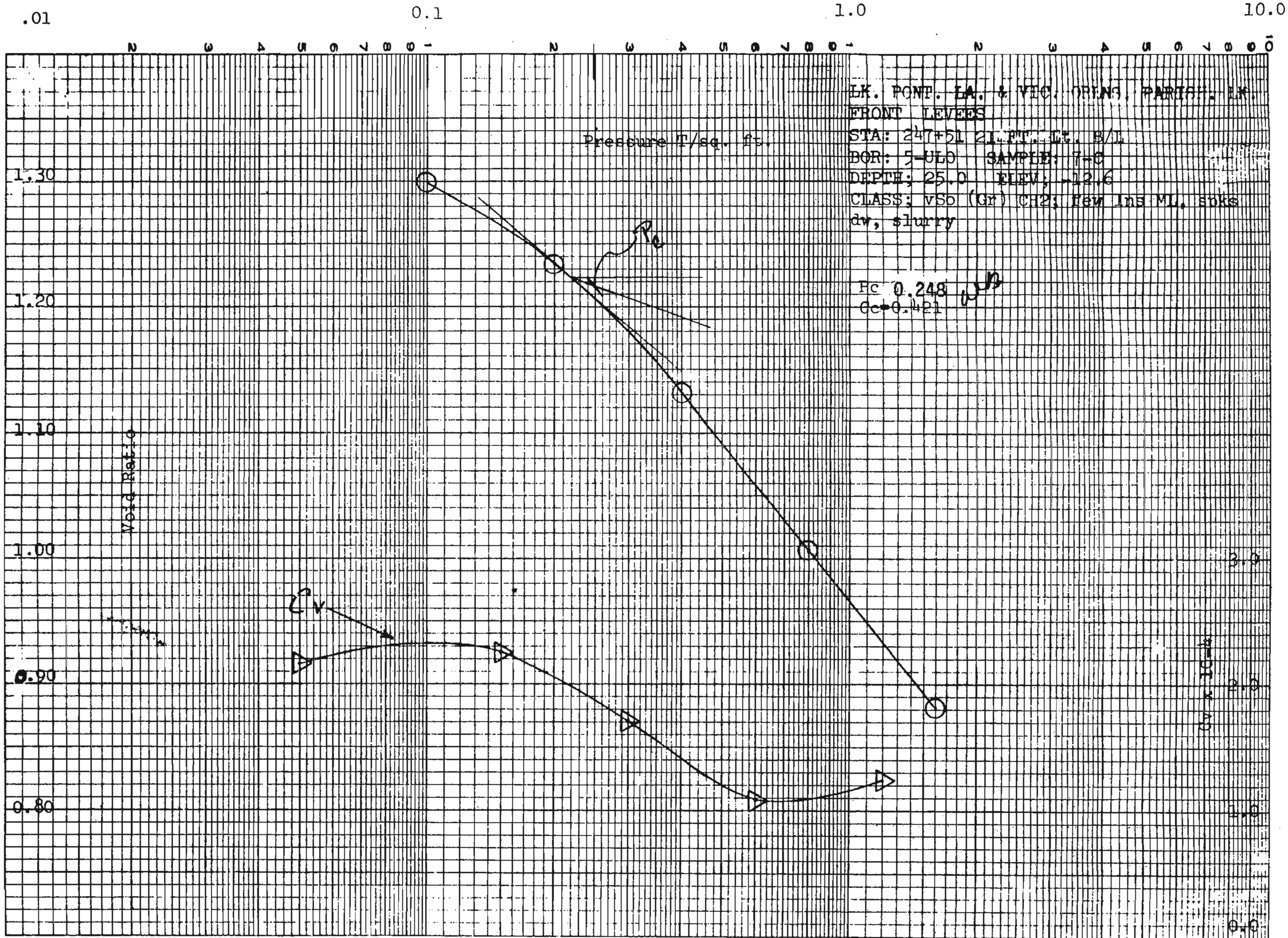
ENG FORM 1 JUN 68 **2092** (EM 1110-2-1906) PREVIOUS EDITIONS ARE OBSOLETE (TRANSLUCENT) PLATE IX-3

NO. 340-L310 DIETZGEN GRAPH PAPER
SEMI-LOGARITHMIC
3 CYCLES X 10 DIVISIONS PER INCH

EUGENE DIETZGEN CO.
MADE IN U. S. A.



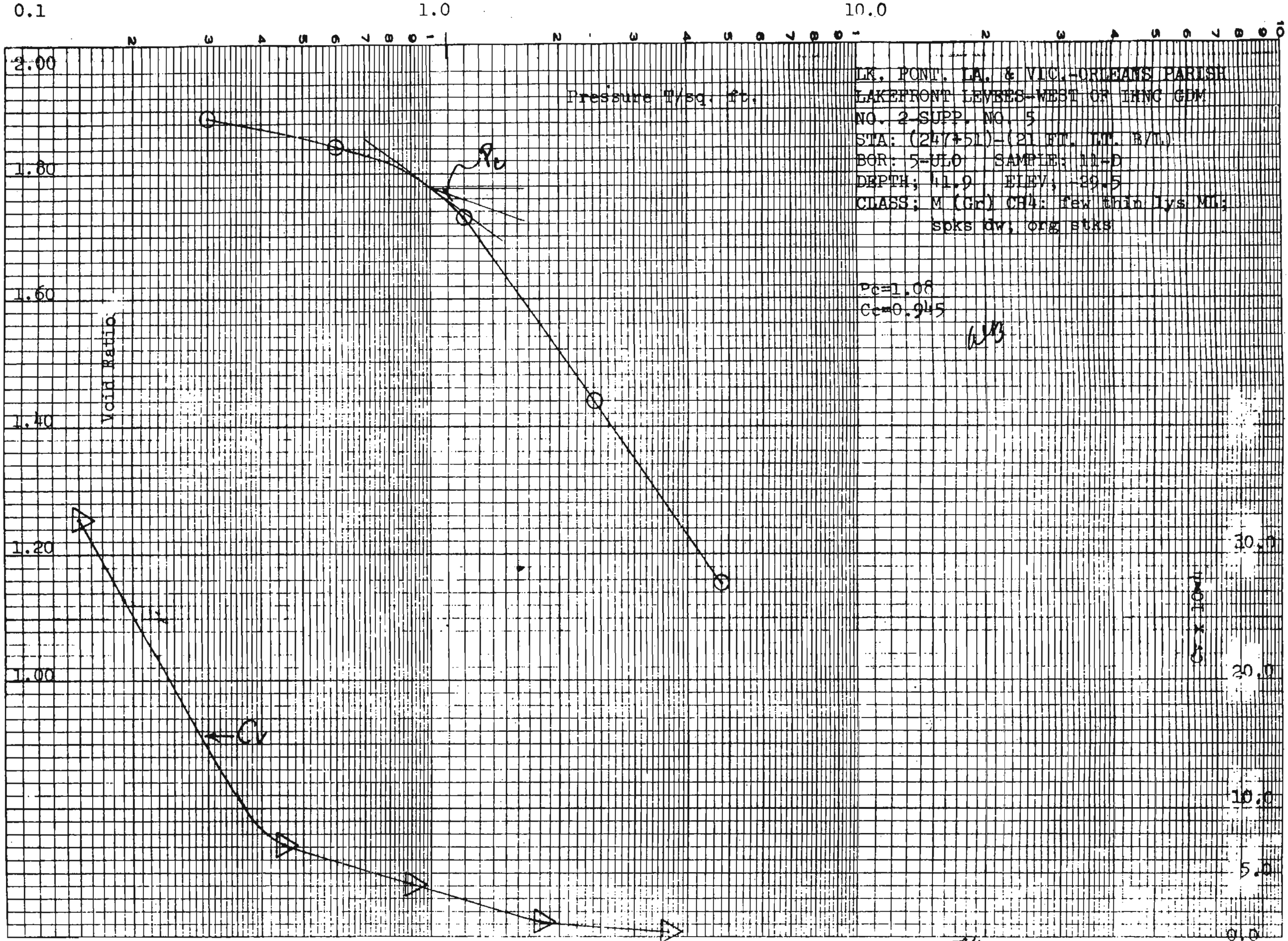
64


.01
0.1
1.0
10.0
Pressure T/sq. ft.
LK. PONT. LA. & VIC. ORLNS. PARISH. LK.
FRONT LEVEES
STA: 247+51 21 FT. Lt. B/L
BOR: 5-ULO SAMPLE: 7-C
DEPTH: 25.0 ELEV: -12.6
CLASS: vSo (Gr) CH2; few lns ML, stks
dw, slurry
Pc
Pc 0.248
Cc=0.421
Cv
Void Ratio
1.30
1.20
1.10
1.00
0.90
0.80
3.0
2.0
1.0
0.0
Cv x 10⁻⁴

TGW.

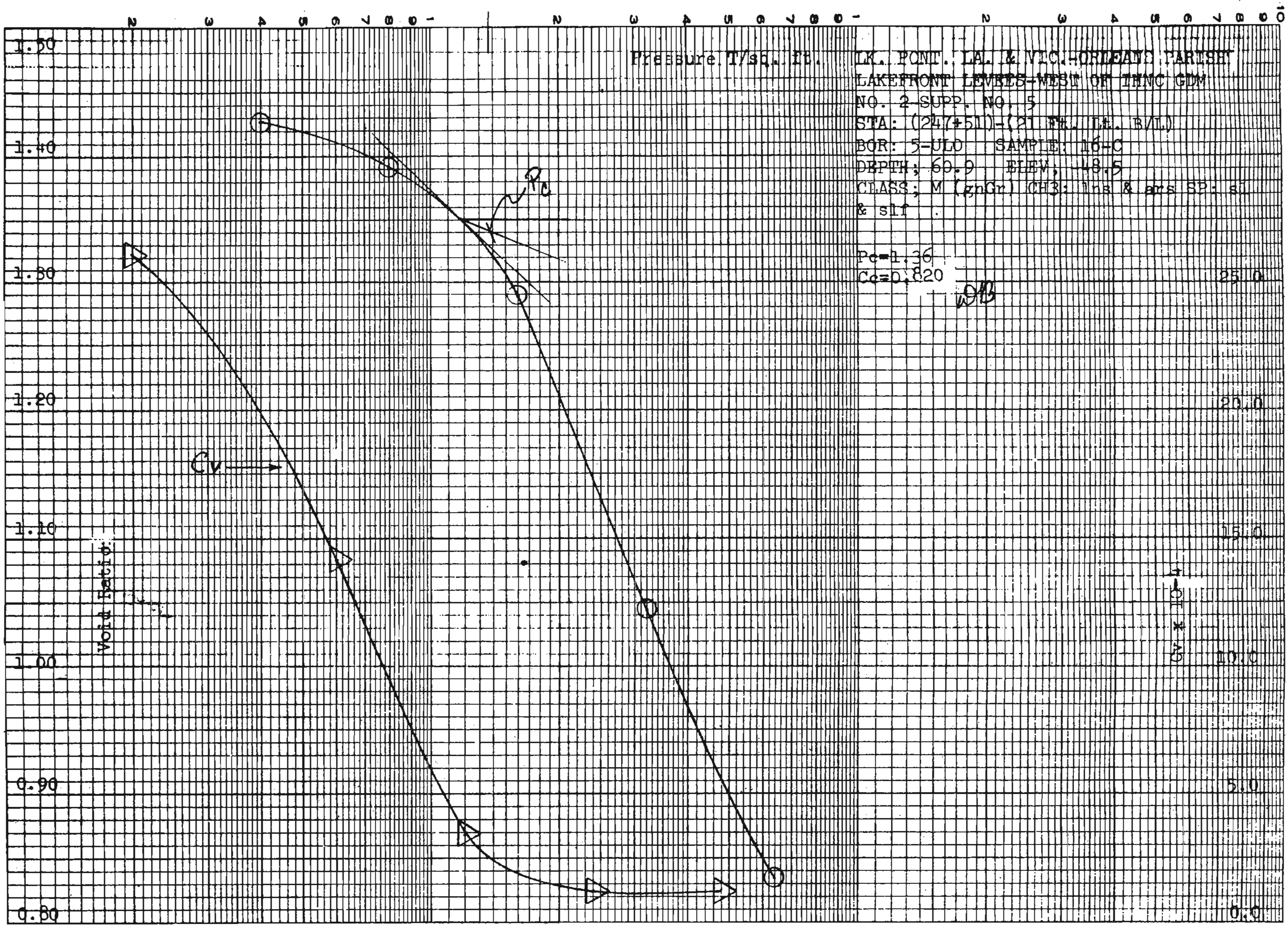
NO. 340-L310 DIETZGEN GRAPH PAPER
SEMI-LOGARITHMIC
3 CYCLES X 10 DIVISIONS PER INCH

EUGENE DIETZGEN CO.
MADE IN U. S. A.



TGW

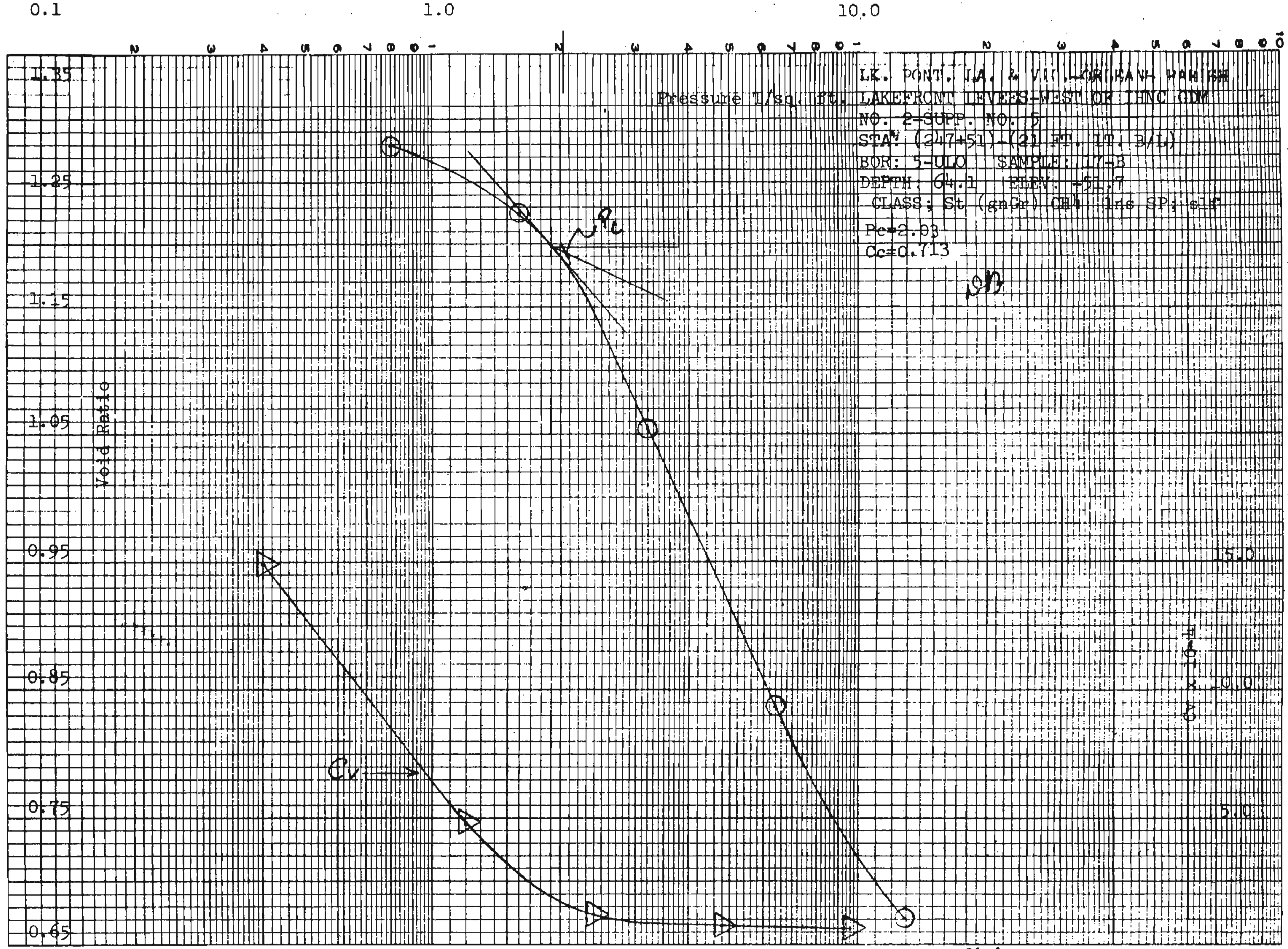
28


0.1
1.0
10.0
Pressure T/sq. ft.
LK. PONT. LA. & VIC.-ORLEANS PARISH
LAKEFRONT LEVEES-WEST OF IHNC GDM
NO. 2-SUPP. NO. 5
STA: (247+51)-(21 Ft. Lt. B/L)
BOR: 5-ULO SAMPLE: 16-C
DEPTH: 60.9 ELEV: -48.5
CLASS: M (gnGr) CH3: lns & ars SP: sl & slf
Pc=1.36
Cc=0.820
Pc
Cv
Void Ratio
Cv * 10^-4
1.50
1.40
1.30
1.20
1.10
1.00
0.90
0.80
25.0
20.0
15.0
10.0
5.0
0.0

TBW

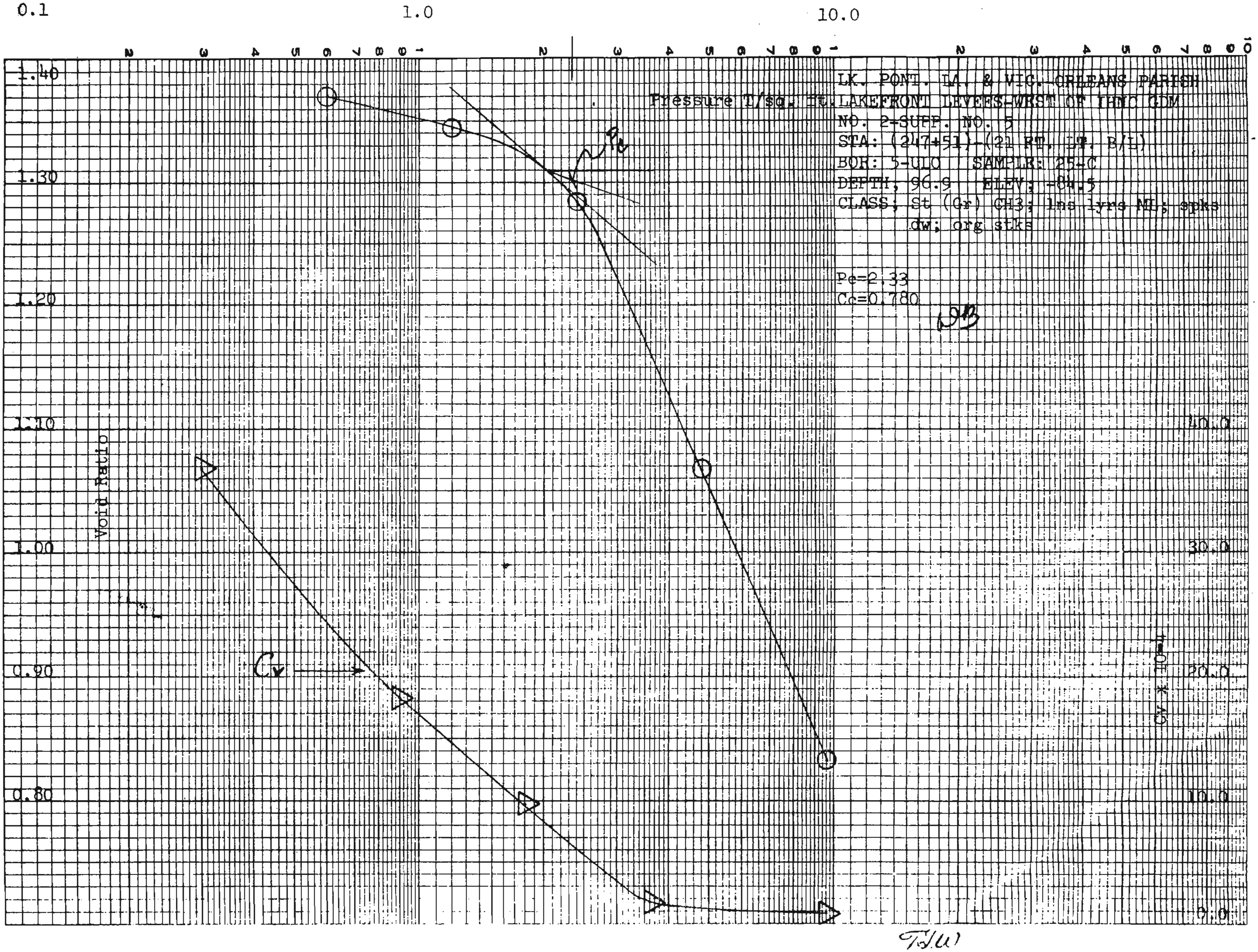
NO. 340-L310 DIETZGEN GRAPH PAPER
SEMI-LOGARITHMIC
3 CYCLES X 10 DIVISIONS PER INCH

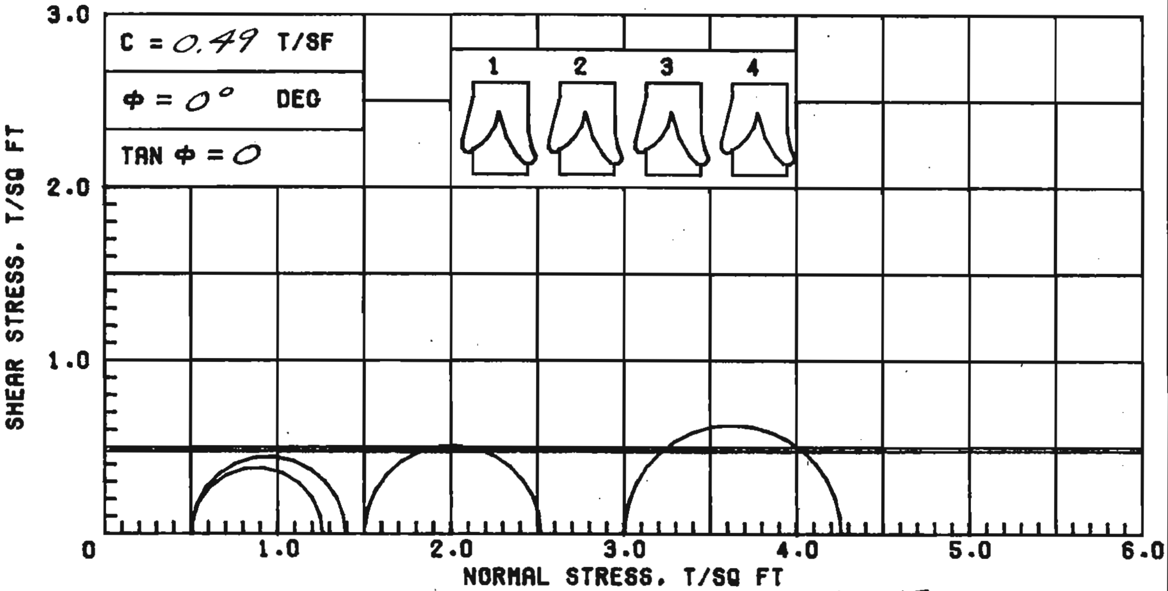
EUGENE DIETZGEN CO.
MADE IN U. S. A.



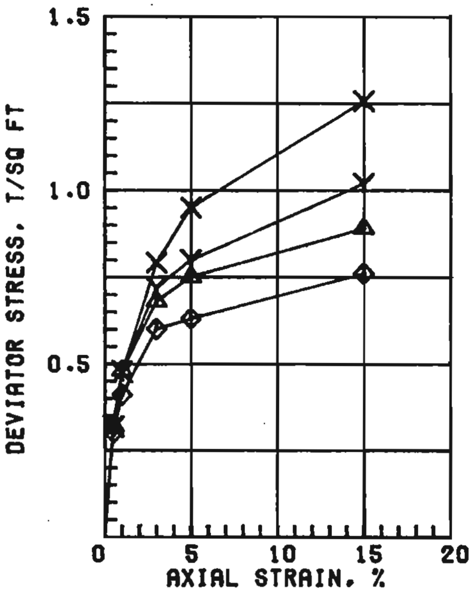
TGW.

88


0.1
1.0
10.0
Pressure T/sq. ft.
LK. PONT. LA. & VIC.-ORLEANS PARISH
LAKEFRONT LEVEES-WEST OF IHNC COM
NO. 2-SUPP. NO. 5
STA: (247+51)-(21 RT. LT. B/L)
BOR: 5-ULO SAMPLR: 25-C
DEPTH, 96.9 ELEV: -84.5
CLASS; St (Gr) CH3; lns lyrs ML; spks dw; org stks
Pe=2.33
Cc=0.780
Pc
Cv
Void Ratio
Cv X 10E-4
1.40
1.30
1.20
1.10
1.00
0.90
0.80
40.0
30.0
20.0
10.0
0.0



γsat. = 117



SPECIMEN NO.		△1	Y2	X3	◇4
INITIAL	WATER CONTENT, %	31.8	32.9	30.1	35.4
	DRY DENSITY, PCF	87.7	86.8	89.1	84.5
	SATURATION, %	93.2	94.4	91.2	96.2
	VOID RATIO	0.921	0.941	0.891	0.994
BEFORE SHEAR	WATER CONTENT, %				
	DRY DENSITY, PCF				
	SATURATION, %				
	VOID RATIO				
	BACK PRESS., TSF				
MIN PRIN. STRESS, TSF		0.5	1.5	3.0	0.5
MAX. DEV. STRESS, TSF		0.89	1.02	1.26	0.76
TIME TO FAILURE, MIN.		40	40	90	35
RATE OF STRAIN INCR.,%					
INITIAL DIAMETER, IN.		1.40	1.40	1.41	1.40
INITIAL HEIGHT, IN.		3.00	3.00	3.00	3.00

Avg. 32.6

CONTROLLED-STRAIN TEST

DESCRIPTION OF SPECIMENS: PLASTIC CLAY (CH), DARK BROWN; SILT POCKETS

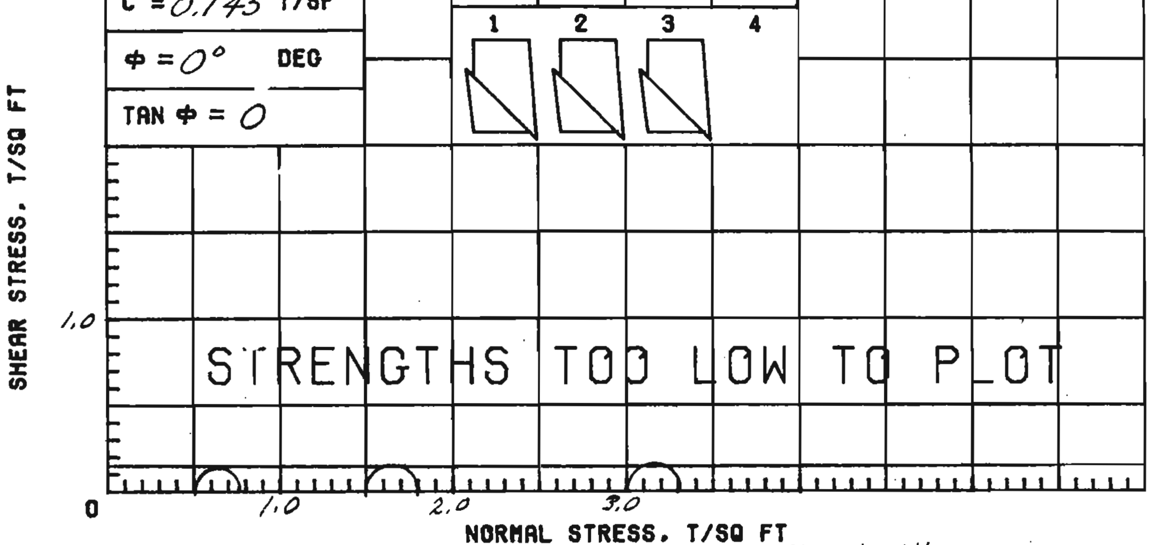
LL 58	PL 21	PI 37	GS 2.70 (ESTIMATED)	UNDISTURBED SPECIMEN	Q TEST

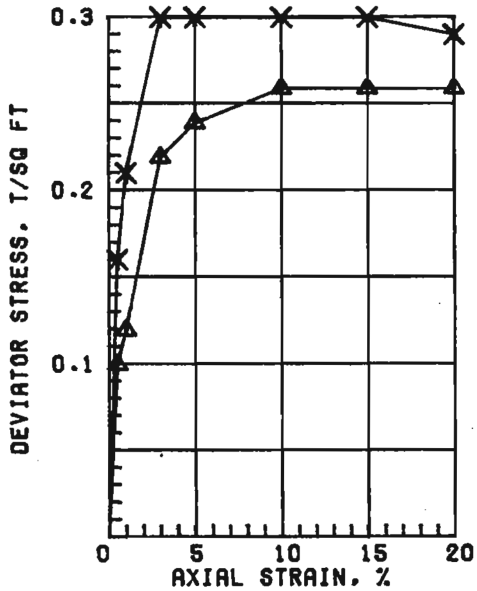
REMARKS:	PROJECT LK. PONT. LA. & VIC. HURR. PROT.	
	ORLEANS PARISH OUTFALL CANALS	
	BORING NO. 1-OUG	SAMPLE NO. 2-C
	DEPTH/ELEV 5.4/+3.6	TECH. PJR
	LABORATORY USAE WES	DATE 14 SEP 84
	TRIAXIAL COMPRESSION TEST REPORT	

C = 0.145 T/SF

Φ = 0° DEG

TAN Φ = 0





γsat = 111

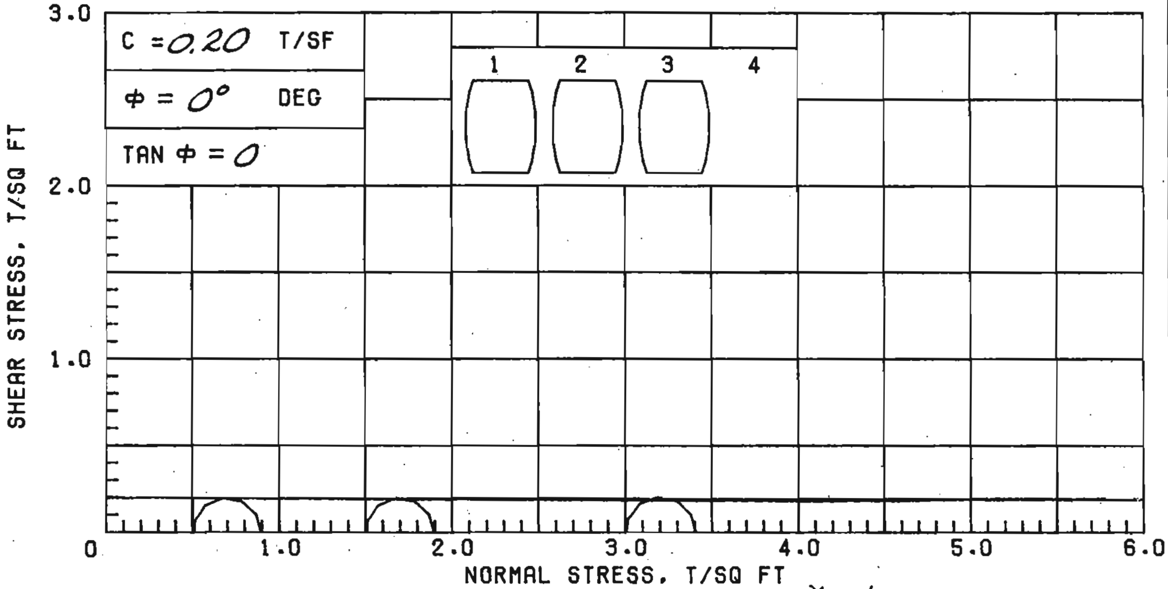
SPECIMEN NO.		Δ1	Y2	X3	Avg. 4
INITIAL	WATER CONTENT, %	42.4	42.5	42.0	42.3
	DRY DENSITY, PCF	77.2	76.9	77.4	
	SATURATION, %	96.7	96.3	96.2	
	VOID RATIO	1.184	1.192	1.179	
BEFORE SHEAR	WATER CONTENT, %				
	DRY DENSITY, PCF				
	SATURATION, %				
	VOID RATIO				
	BACK PRESS., TSF				
MIN PRIN. STRESS, TSF		0.5	1.5	3.0	
MAX. DEV. STRESS, TSF		0.26	0.30	0.30	
TIME TO FAILURE, MIN.		20	6	6	
RATE OF STRAIN INCR.%					
INITIAL DIAMETER, IN.		1.40	1.40	1.40	
INITIAL HEIGHT, IN.		3.00	3.00	3.00	

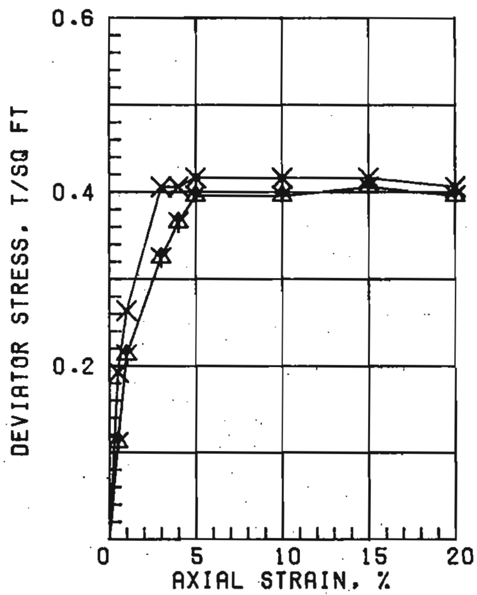
CONTROLLED-STRAIN TEST

DESCRIPTION OF SPECIMENS: CLAY (CL), GRAY; SILT LENSES

LL 47	PL 15	PI 32	GS 2.70 (ESTIMATED)	UNDISTURBED SPECIMEN	Q TEST

REMARKS:	PROJECT LK. PONT. LA. & VIC. HURR. PROT.	
	ORLEANS PARISH OUTFALL CANALS	
	BORING NO. 1-OUG	SAMPLE NO. 4-B
	DEPTH/ELEV 12.1/-3.1	TECH. KOC
	LABORATORY USAE WES	DATE 14 SEP 84
	TRIAXIAL COMPRESSION TEST REPORT	





γsat. 116

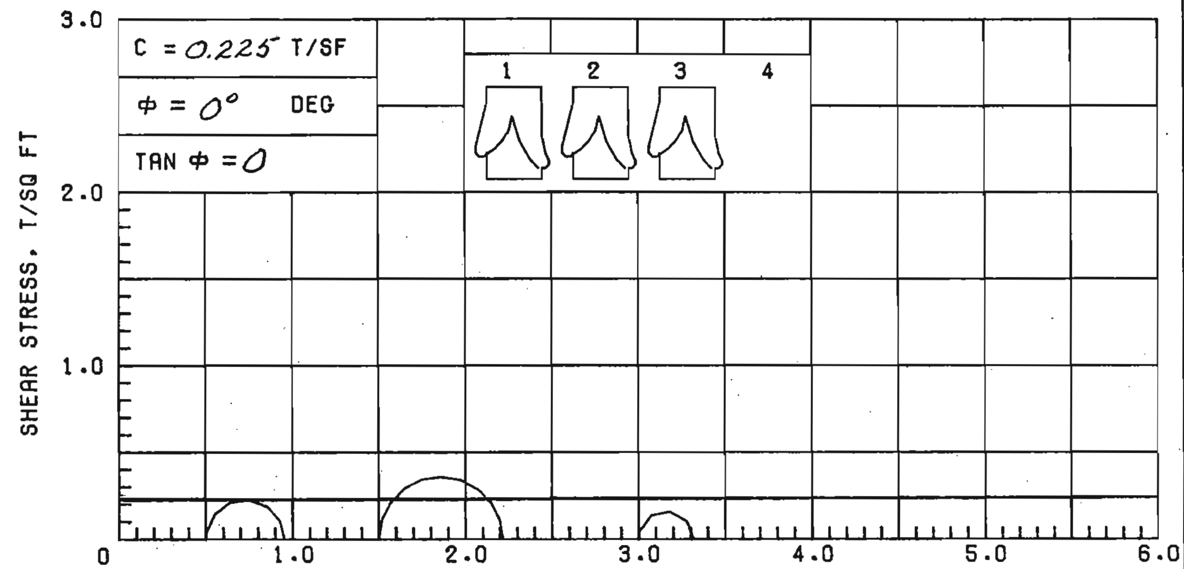
		SPECIMEN NO.	△1	Y2	X3	4 Avg.
INITIAL		WATER CONTENT, %	32.1	39.2	34.7	35.3
		DRY DENSITY, PCF	88.5	81.2	86.3	
		SATURATION, %	95.9	98.3	98.3	
		VOID RATIO	0.904	1.077	0.953	
BEFORE SHEAR		WATER CONTENT, %				
		DRY DENSITY, PCF				
		SATURATION, %				
		VOID RATIO				
		BACK PRESS., TSF				
MIN PRIN. STRESS, TSF			0.5	1.5	3.0	
MAX. DEV. STRESS, TSF			0.40	0.40	0.41	
TIME TO FAILURE, MIN.			10	10	6	
RATE OF STRAIN INCR.%						
INITIAL DIAMETER, IN.			1.39	1.39	1.39	
INITIAL HEIGHT, IN.			3.00	3.00	3.00	

CONTROLLED-STRAIN TEST

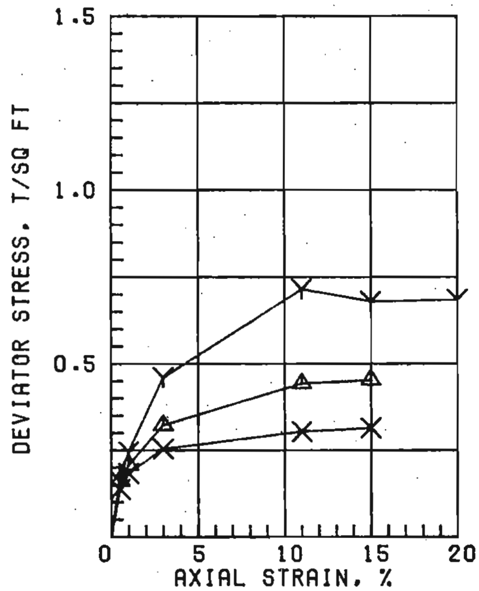
DESCRIPTION OF SPECIMENS: PLASTIC CLAY (CH), GRAY; SILT POCKETS

LL	PL	PI	GS 2.70 (ESTIMATED)	UNDISTURBED SPECIMEN	Q TEST

REMARKS:	PROJECT LK. PONT. LA. & VIC. HURR. PROT. ORLEANS PARISH OUTFALL CANALS	
	BORING NO. 1-OUG	SAMPLE NO. 4-D
	DEPTH/ELEV 14.1/-5.1	TECH. KOC
	LABORATORY USAE WES	DATE 14 SEP 84
	TRIAXIAL COMPRESSION TEST REPORT	



γsat. = 113



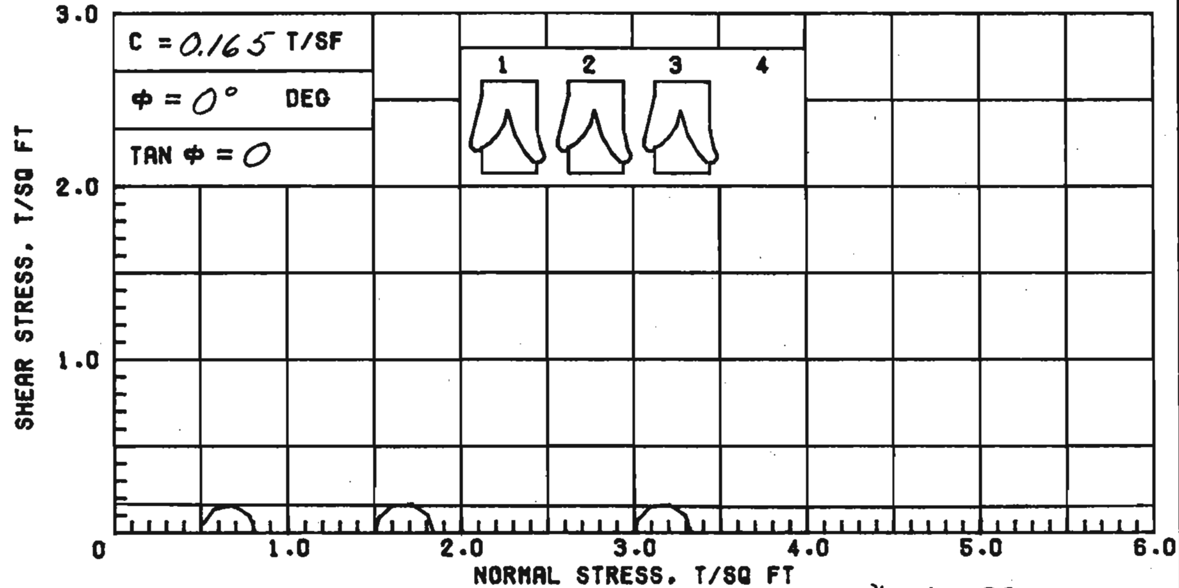
	SPECIMEN NO.	△1	Y2	X3	Avg. 4
INITIAL	WATER CONTENT, %	38.6	33.1	52.4	41.4
	DRY DENSITY, PCF	81.3	87.2	70.4	
	SATURATION, %	97.0	95.9	100+	
	VOID RATIO	1.074	0.932	1.394	
BEFORE SHEAR	WATER CONTENT, %				-
	DRY DENSITY, PCF				
	SATURATION, %				
	VOID RATIO				
	BACK PRESS., TSF				
	MIN PRIN. STRESS, TSF	0.5	1.5	3.0	
	MAX. DEV. STRESS, TSF	0.45	0.71	0.31	
	TIME TO FAILURE, MIN.	30	24	35	
	RATE OF STRAIN INCR,%				
	INITIAL DIAMETER, IN.	1.39	1.40	1.39	
	INITIAL HEIGHT, IN.	3.00	3.00	3.00	

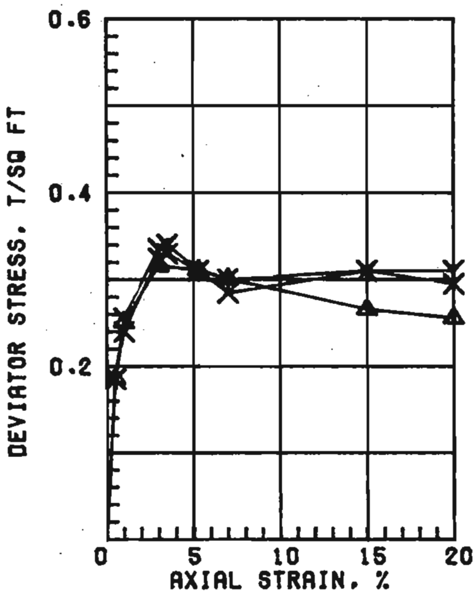
CONTROLLED-STRAIN TEST

DESCRIPTION OF SPECIMENS; CLAY (CL), GRAY; SILT POCKETS

LL 45	PL 16	PI 29	GS 2.70 (ESTIMATED)	UNDISTURBED SPECIMEN	Q TEST

REMARKS;	PROJECT LK. PONT. LA. & VIC. HURR. PROT. ORLEANS PARISH OUTFALL CANALS	
	BORING NO. 1-OUG	SAMPLE NO. 9-B
	DEPTH/ELEV 32.2/-23.2	TECH. PJR
	LABORATORY USAE WES	DATE 17 SEP 84
	TRIAXIAL COMPRESSION TEST REPORT	





γsat. = 99

SPECIMEN NO.		△1	Y2	X3	4 Avg.
INITIAL	WATER CONTENT, %	71.7	71.1	71.2	71.3
	DRY DENSITY, PCF	57.5	57.9	57.7	
	SATURATION, %	100+	100+	100.0	
	VOID RATIO	1.933	1.912	1.923	
BEFORE SHEAR	WATER CONTENT, %				
	DRY DENSITY, PCF				
	SATURATION, %				
	VOID RATIO				
	BACK PRESS., TSF				
MIN PRIN. STRESS, TSF		0.5	1.5	3.0	
MAX. DEV. STRESS, TSF		0.32	0.34	0.33	
TIME TO FAILURE, MIN.		7	24	28	
RATE OF STRAIN INCR.%			8	7	
INITIAL DIAMETER, IN.		1.40	1.40	1.40	
INITIAL HEIGHT, IN.		3.00	3.00	3.00	

CONTROLLED-STRAIN TEST

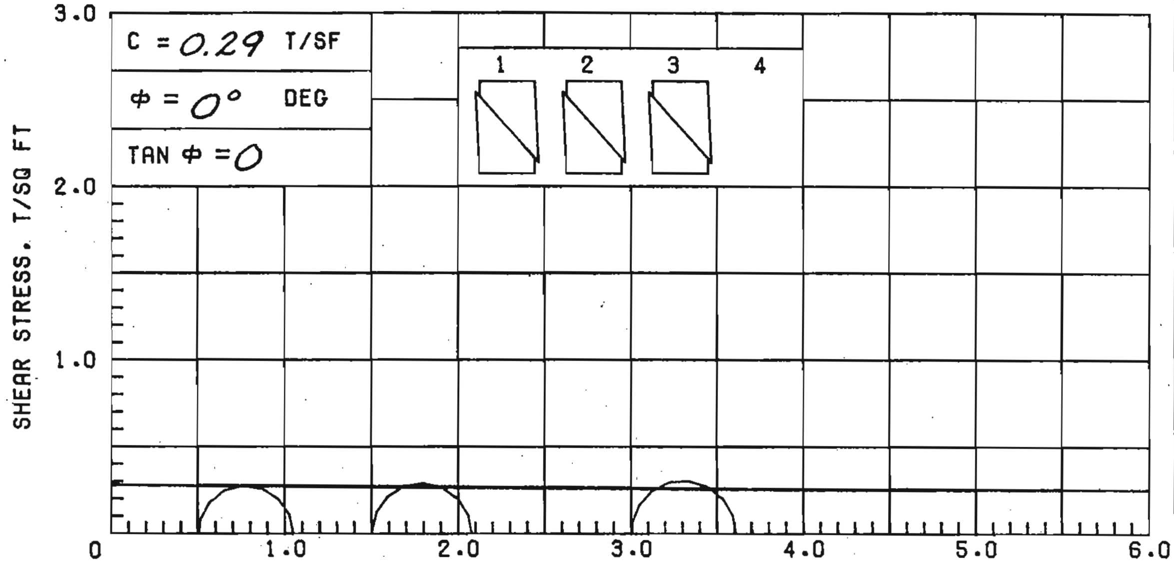
DESCRIPTION OF SPECIMENS: PLASTIC CLAY (CH), GRAY

LL 89	PL 29	PI 60	GS 2.70 (ESTIMATED)	UNDISTURBED SPECIMEN	Q TEST

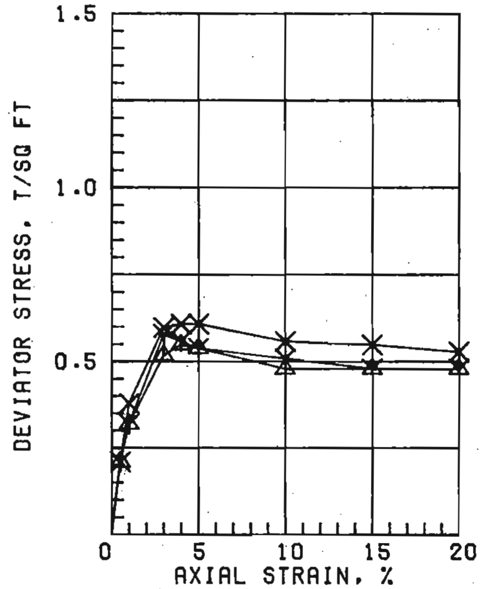
REMARKS:

PROJECT LK. PONT. LA. & VIC. HURR. PROT. ORLEANS PARISH OUTFALL CANALS	
BORING NO. 1-OUG	SAMPLE NO. 11-C
DEPTH/ELEV 41.3/-32.3	TECH. PJR
LABORATORY USAE WES	DATE 17 SEP 84

TRIAXIAL COMPRESSION TEST REPORT



γsat = 103



		Δ1	Y2	X3	4 (Avg.)
SPECIMEN NO.		Δ1	Y2	X3	4
INITIAL	WATER CONTENT, %	57.7	54.0	58.7	56.8
	DRY DENSITY, PCF	64.5	65.9	63.9	
	SATURATION, %	96.5	93.7	96.8	
	VOID RATIO	1.615	1.556	1.638	
BEFORE SHEAR	WATER CONTENT, %				-
	DRY DENSITY, PCF				
	SATURATION, %				
	VOID RATIO				
	BACK PRESS., TSF				
MIN PRIN. STRESS, TSF		0.5	1.5	3.0	
MAX. DEV. STRESS, TSF		0.55	0.58	0.61	
TIME TO FAILURE, MIN.		8	6	8	
RATE OF STRAIN INCR,%					
INITIAL DIAMETER, IN.		1.40	1.40	1.40	
INITIAL HEIGHT, IN.		3.00	3.00	3.00	

CONTROLLED-STRAIN TEST

DESCRIPTION OF SPECIMENS; PLASTIC CLAY (CH), GRAY; SILT POCKETS

LL 102	PL 20	PI 82	GS 2.70 (ESTIMATED)	UNDISTURBED SPECIMEN	Q TEST

REMARKS;

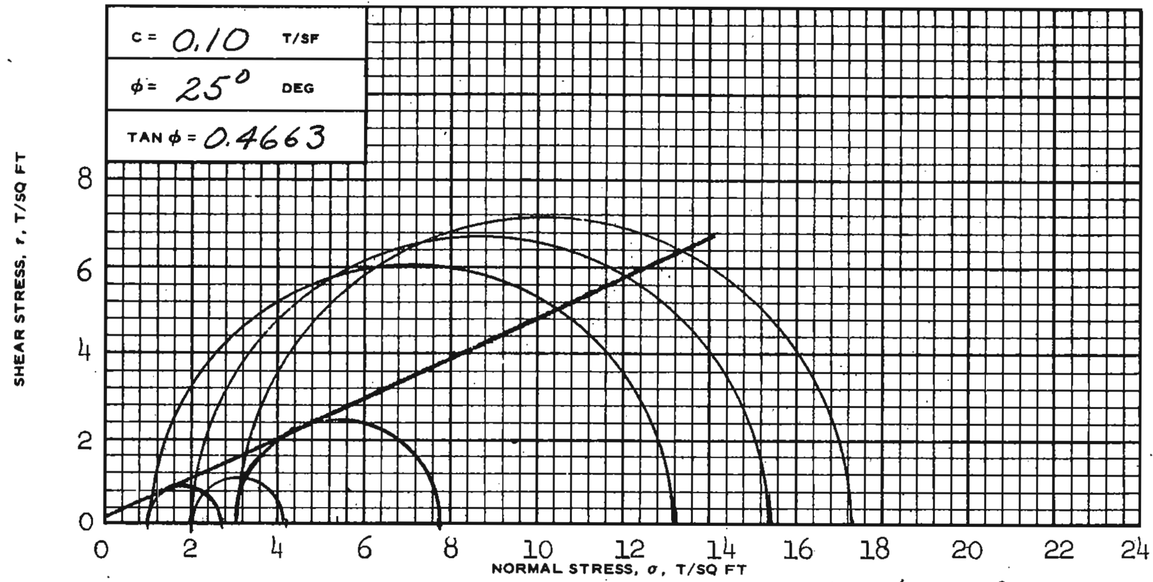
PROJECT LK. PONT. LA. & VIC. HURR. PROT. ORLEANS PARISH OUTFALL CANALS	
BORING NO. 1-OUG	SAMPLE NO. 15-B
DEPTH/ELEV 56.4/-47.4	TECH. KOC
LABORATORY USAE WES	DATE 17 SEP 84

TRIAXIAL COMPRESSION TEST REPORT

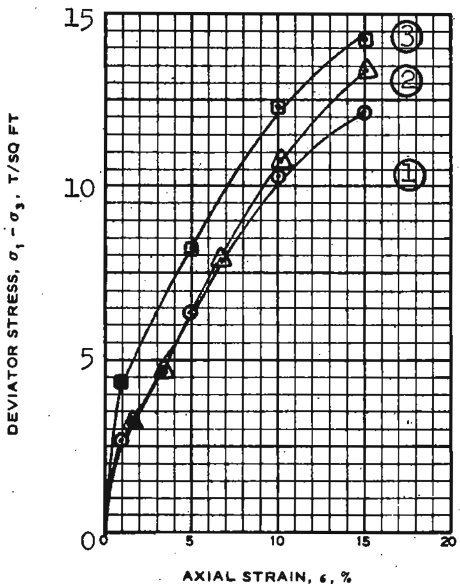
c = 0.10 T/SF

ϕ = 25° DEG

TAN ϕ = 0.4663



$\gamma sat.$ = 120



SPECIMEN NO.			1	2	3	Avg.
INITIAL	WATER CONTENT, %	w_o	28.7	29.8	30.0	29.5
INITIAL	DRY DENSITY LB/CU FT	γd_o	94.2	91.3	90.4	
INITIAL	SATURATION, %	S_o	98.9	96.0	94.5	
INITIAL	VOID RATIO	e_o	0.777	0.832	0.851	
BEFORE SHEAR	WATER CONTENT, %	w_c	30.1	30.0	31.0	
BEFORE SHEAR	DRY DENSITY LB/CU FT	γd_c	96.9	93.5	93.9	
BEFORE SHEAR	SATURATION, %	S_c	100+	100+	100+	
BEFORE SHEAR	VOID RATIO	e_c	0.726	0.789	0.782	
BEFORE SHEAR	FINAL BACK PRESSURE, T/SQ FT	u_o	4.32	4.32	4.32	
MINOR PRINCIPAL STRESS, T/SQ FT		σ_3	1.0	2.0	3.0	
MAXIMUM DEVIATOR STRESS, T/SQ FT		$(\sigma_1 - \sigma_3)_{MAX}$	12.22	13.41	14.35	
TIME TO $(\sigma_1 - \sigma_3)_{MAX}$, MIN		t_f	1154	1154	1154	
ULTIMATE DEVIATOR STRESS, T/SQ FT		$(\sigma_1 - \sigma_3)_{ULT}$	1.75	2.25	4.75	
INITIAL DIAMETER, IN.		D_o	1.39	1.41	1.37	
INITIAL HEIGHT, IN.		H_o	3.00	3.00	3.00	

CONTROLLED- STRAIN TEST

DESCRIPTION OF SPECIMENS SANDY SILT (ML), GRAY; SHELL PARTICLES

LL	PL	PI	G_s 2.68 (EST)	TYPE OF SPECIMEN UNDISTURBED	TYPE OF TEST R

REMARKS:

PROJECT LK. PONT. LA. & VIC. HURR. PROT. ORLEANS PARISH OUTFALL CANALS

BORING NO. 1-OUG — SAMPLE NO. 6-C

DEPTH/ELEV 21.0/-12.0

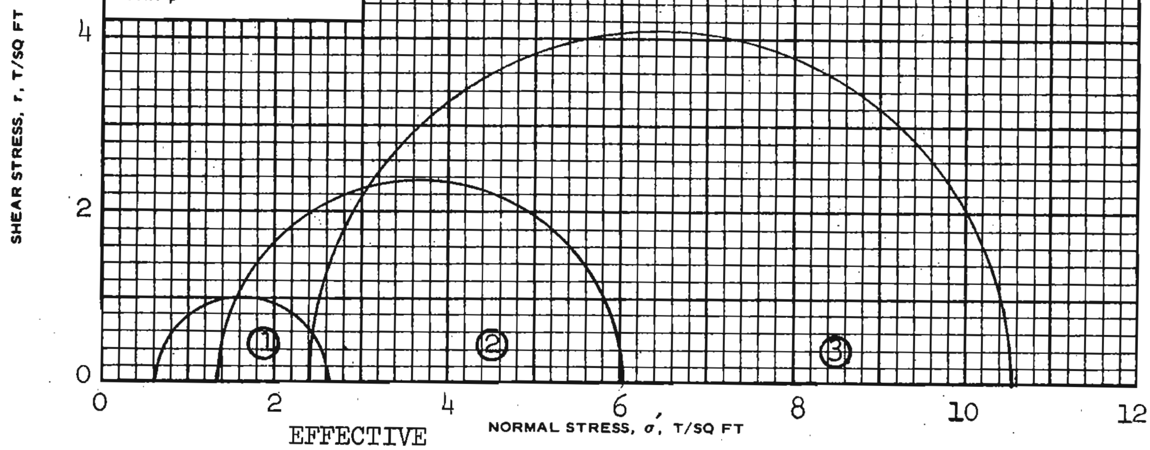
LABORATORY USAEWES — DATE 30 AUG 1984

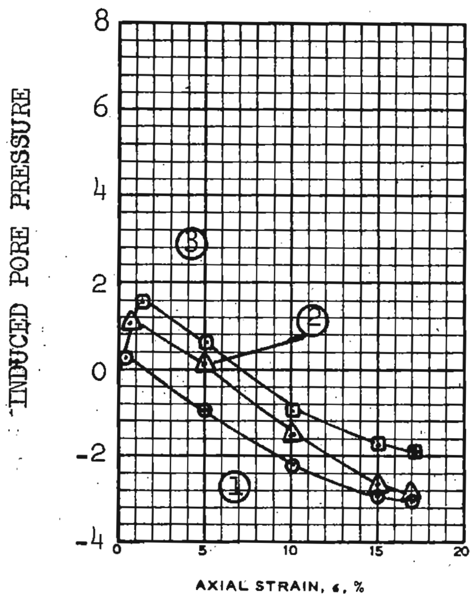
SHEET 1 OF 2 — JMS — **TRIAXIAL COMPRESSION TEST REPORT**

ENG FORM NO. 2089 REV JUNE 1970 PREVIOUS EDITION IS OBSOLETE

BASED ON MAX $\bar{\sigma}_1/\bar{\sigma}_3$

c' =	T/SF
ϕ' =	DEG
TAN ϕ' =	





SPECIMEN NO.			1	2	3	
INITIAL	WATER CONTENT, %	w_o				
	DRY DENSITY LB/CU FT	γd_o				
	SATURATION, %	S_o				
	VOID RATIO	e_o				
BEFORE SHEAR	WATER CONTENT, %	w_c				
	DRY DENSITY LB/CU FT	γd_c				
	SATURATION, %	S_c				
	VOID RATIO	e_c				
	FINAL BACK PRESSURE, T/SQ FT	u_o				
MINOR PRINCIPAL STRESS, T/SQ FT		σ_3	0.60	1.37	2.42	
MAXIMUM DEVIATOR STRESS, T/SQ FT		$(\sigma_1 - \sigma_3)_{MAX}$	2.06	4.64	8.16	
TIME TO $(\sigma_1 - \sigma_3)_{MAX}$, MIN		t_f				
ULTIMATE DEVIATOR STRESS, T/SQ FT		$(\sigma_1 - \sigma_3)_{ULT}$				
INITIAL DIAMETER, IN.		D_o				
INITIAL HEIGHT, IN.		H_o				

CONTROLLED- TEST

DESCRIPTION OF SPECIMENS

LL	PL	PI	Gs	TYPE OF SPECIMEN	TYPE OF TEST

REMARKS:

PROJECT LK. PONT. LA. & VIC. HURR. PROT.
ORLEANS PARISH OUTFALL CANALS

BORING NO. 1-OUG SAMPLE NO. 6-C

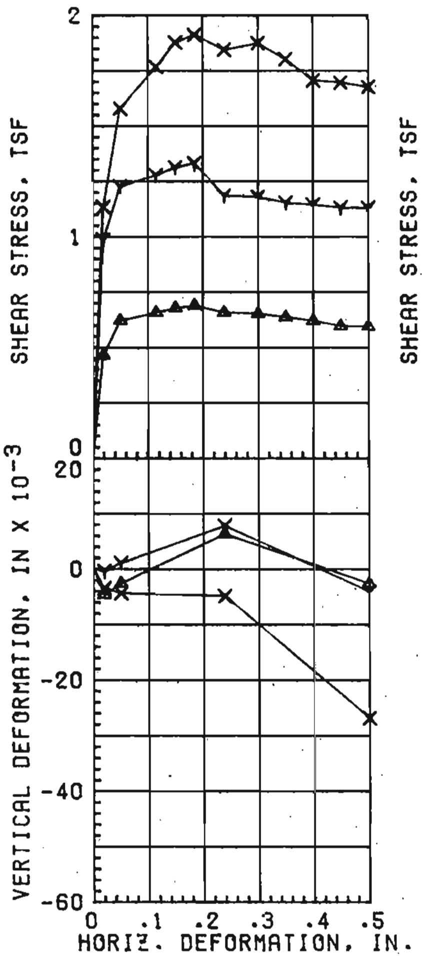
DEPTH/ELEV 21.0/-12.0

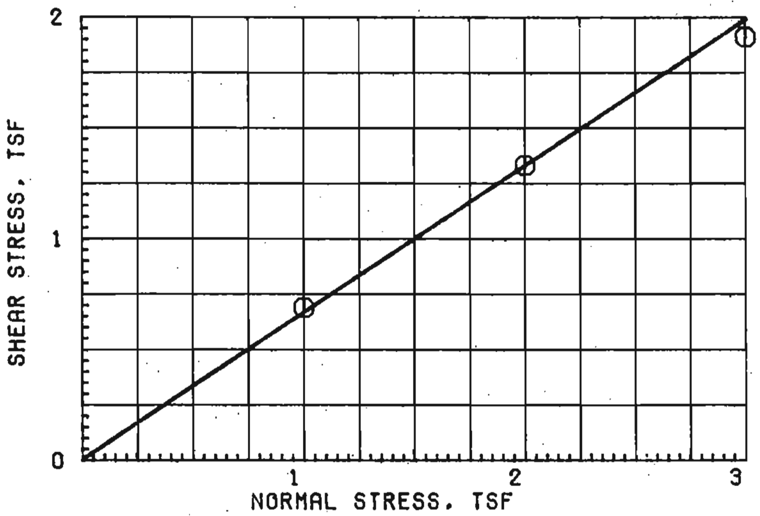
LABORATORY USAEWES DATE 30 AUG 1984

SHEET 2 OF 2

JMS **TRIAXIAL COMPRESSION TEST REPORT**

ENG FORM NO. 2089 REV JUNE 1970 PREVIOUS EDITION IS OBSOLETE





ϕ = 33.5°

TAN ϕ = 0.6619

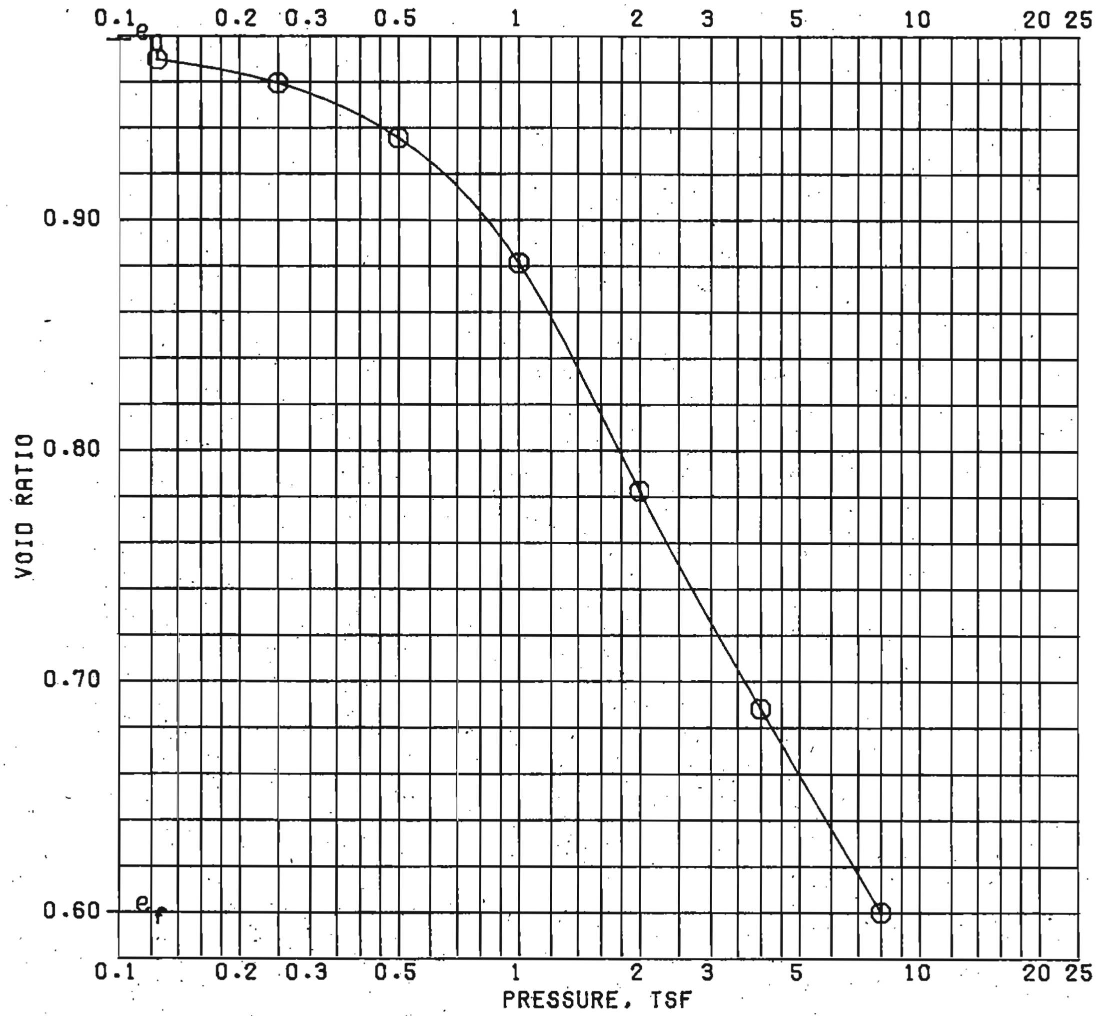
C = 0

γsat.=121

		TEST NO.	1 ▲	2 Y	3 X	Avg.
INITAL		WATER CONTENT, %	25.9	25.2	26.1	25.7
		VOID RATIO	0.775	0.758	0.792	
		SATURATION, %	89.3	88.9	87.9	
		DRY DENSITY, PCF	93.8	94.8	93.0	
VOID RATIO AFTER CONSOL						
FIFTY PERCENT CONSOL, MIN			< 1	< 1	< 1	
FINAL		WATER CONTENT, %	28.8	27.3	27.9	
		VOID RATIO				
		SATURATION, %				
NORMAL STRESS, TSF			1.0	2.0	3.0	
MAXIMUM SHEAR STRESS, TSF			0.69	1.33	1.91	
TIME TO FAILURE, MIN			978	978	978	
RATE OF STRAIN, IN/MIN			.00019	.00019	.00019	
ULTIMATE SHEAR STRESS, TSF						

TYPE SPECIMEN UNDISTURBED			3.00 IN. SQUARE	0.756 IN. THICK
CLASSIFICATION SILTY SAND (SM), GRAY; SHELL PARTICLES				
LL	PL	PI		GS 2.67 (EST)
REMARKS;		PROJECT LAKE PONT. LA. & VIC. HURR. PROT.		
		ORLEANS PARISH OUTFALL CANALS		
		BORING NO. 1-0UG		SAMPLE 12-B
		DEPTH/ELEV 44.0/-35.0		DATE 04 OCT 84

DIRECT SHEAR TEST REPORT

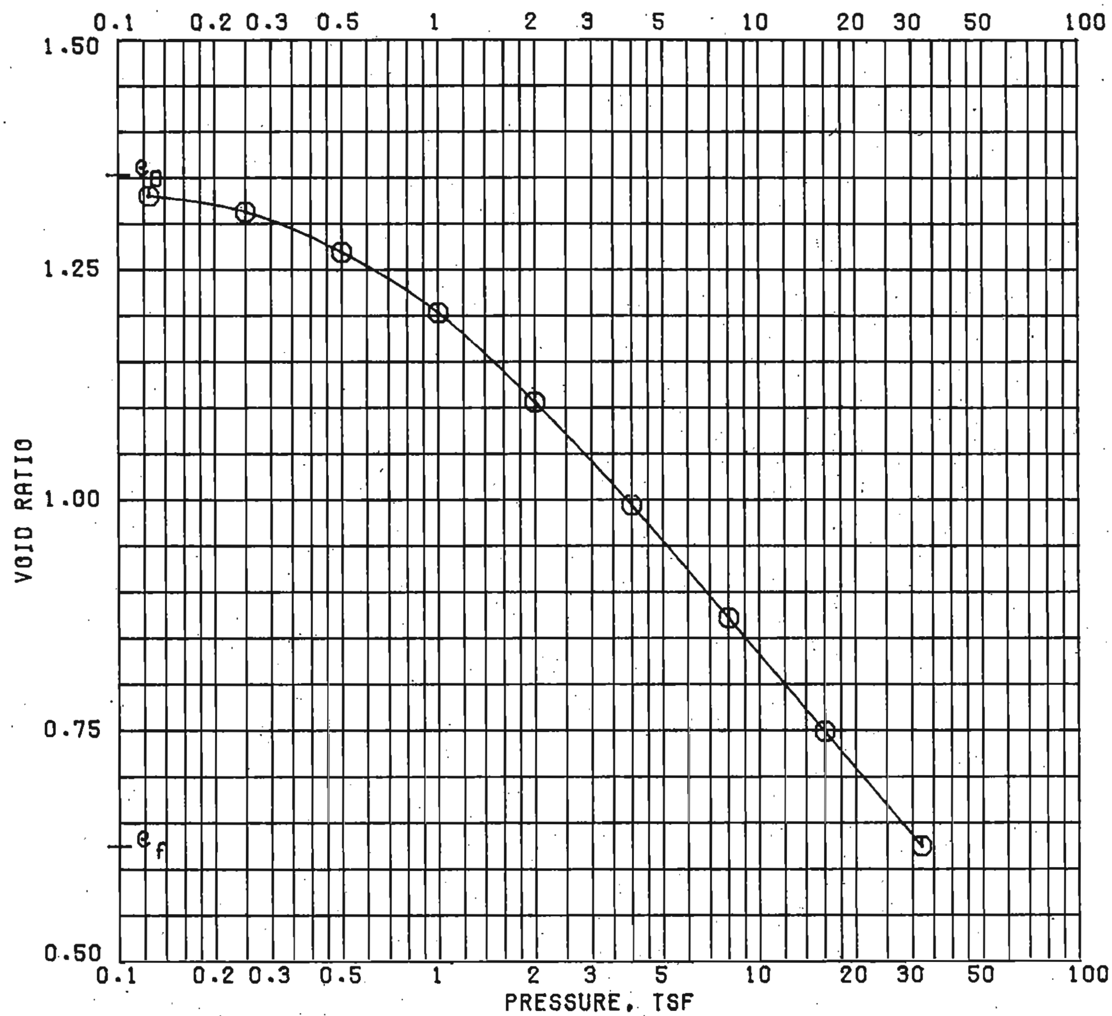


$\gamma_{sat.} = 116$

			BEFORE TEST	AFTER TEST
OVERBURDEN PRESSURE, TSF		WATER CONTENT, %	34.7	22.4
PRECONSOL. PRESSURE, TSF	0.59	DRY DENSITY, PCF	85.2	105.4
COMPRESSION INDEX		SATURATION, %	96.0	100 +
TYPE SPECIMEN	UNDISTURBED	VOID RATIO	0.978	0.599
DIA. IN 4.44	HT. IN 1.136	BACK PRESSURE, TSF		

CLASSIFICATION PLASTIC CLAY (CH), GRAY; SHELL PARTICLES				
LL	PL	PI	PROJECT LK. PONT. LA. & VIC. HURR. PROT.	
GS 2.70 (EST)	D_{10}		ORLEANS PARISH OUTFALL CANALS	
REMARKS			BORING NO. 1-0UG	SAMPLE NO. 4-C
			DEPTH/ELEV 12.8/-3.8	DATE 26 SEP 84
			CONSOLIDATION TEST REPORT	

SHEET 1 OF 9



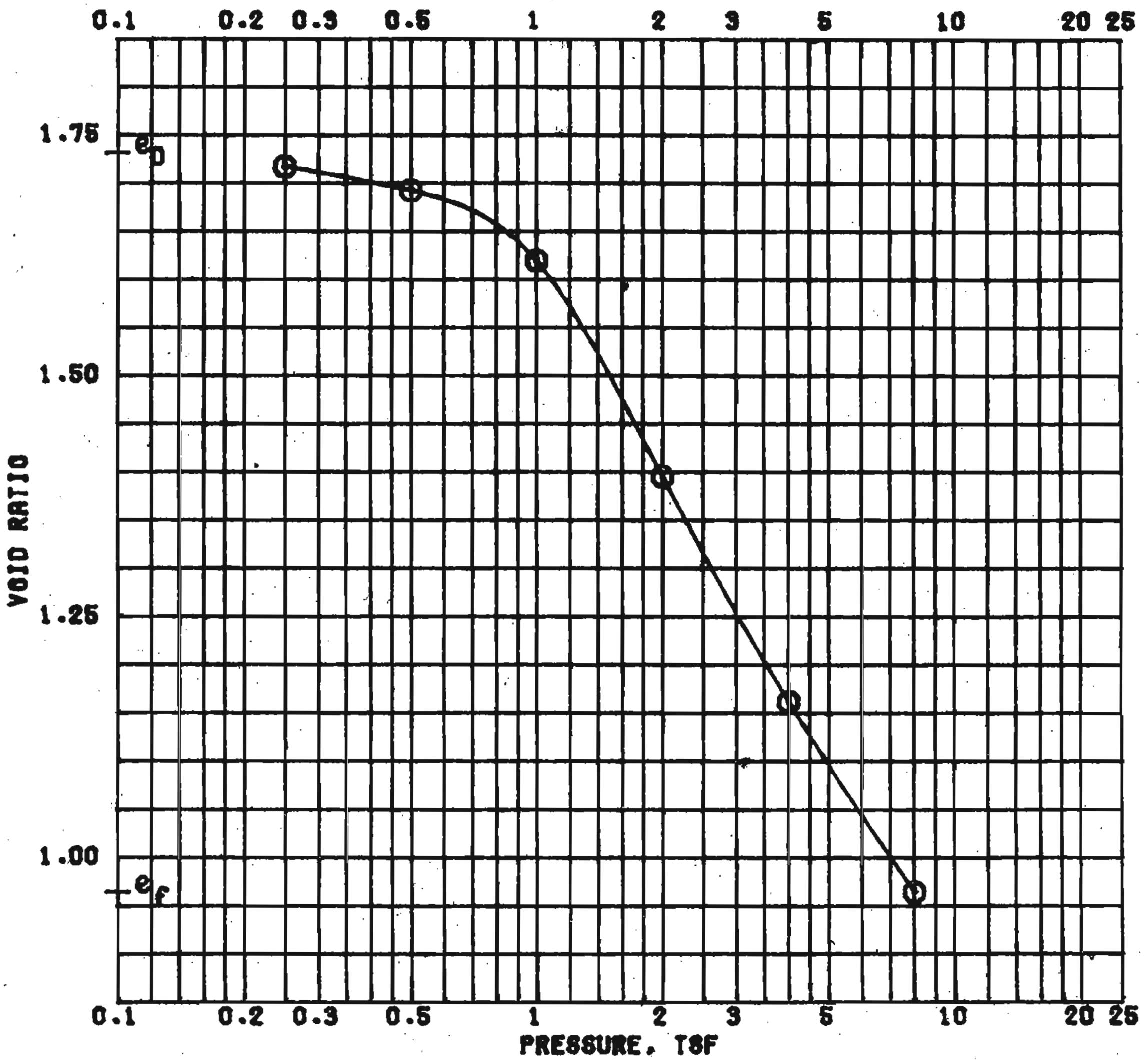
$\gamma_{sat} = 108$

			BEFORE TEST	AFTER TEST
OVERBURDEN PRESSURE, TSF		WATER CONTENT, %	48.2	27.3
PRECONSOL. PRESSURE, TSF	1.06	DRY DENSITY, PCF	71.7	103.9
COMPRESSION INDEX		SATURATION, %	96.2	100 +
TYPE SPECIMEN	UNDISTURBED	VOID RATIO	1.351	0.623
DIA. IN 4.44	HT. IN 1.115	BACK PRESSURE, TSF		

CLASSIFICATION	PLASTIC CLAY (CH), GRAY; FINE SAND LENSES; SHELL PARTICLES		
LL	PL	PI	PROJECT LK. PONT. LA. & VIC. HURR. PROT.
GS 2.70 (EST)	D_{10}		ORLEANS PARISH OUTFALL CANALS
REMARKS		BORING NO. 1-OUG	SAMPLE NO. 9-B
		DEPTH/ELEV 32.5/-23.5	DATE 01 OCT 84

CONSOLIDATION TEST REPORT

SHEET 1 OF 11



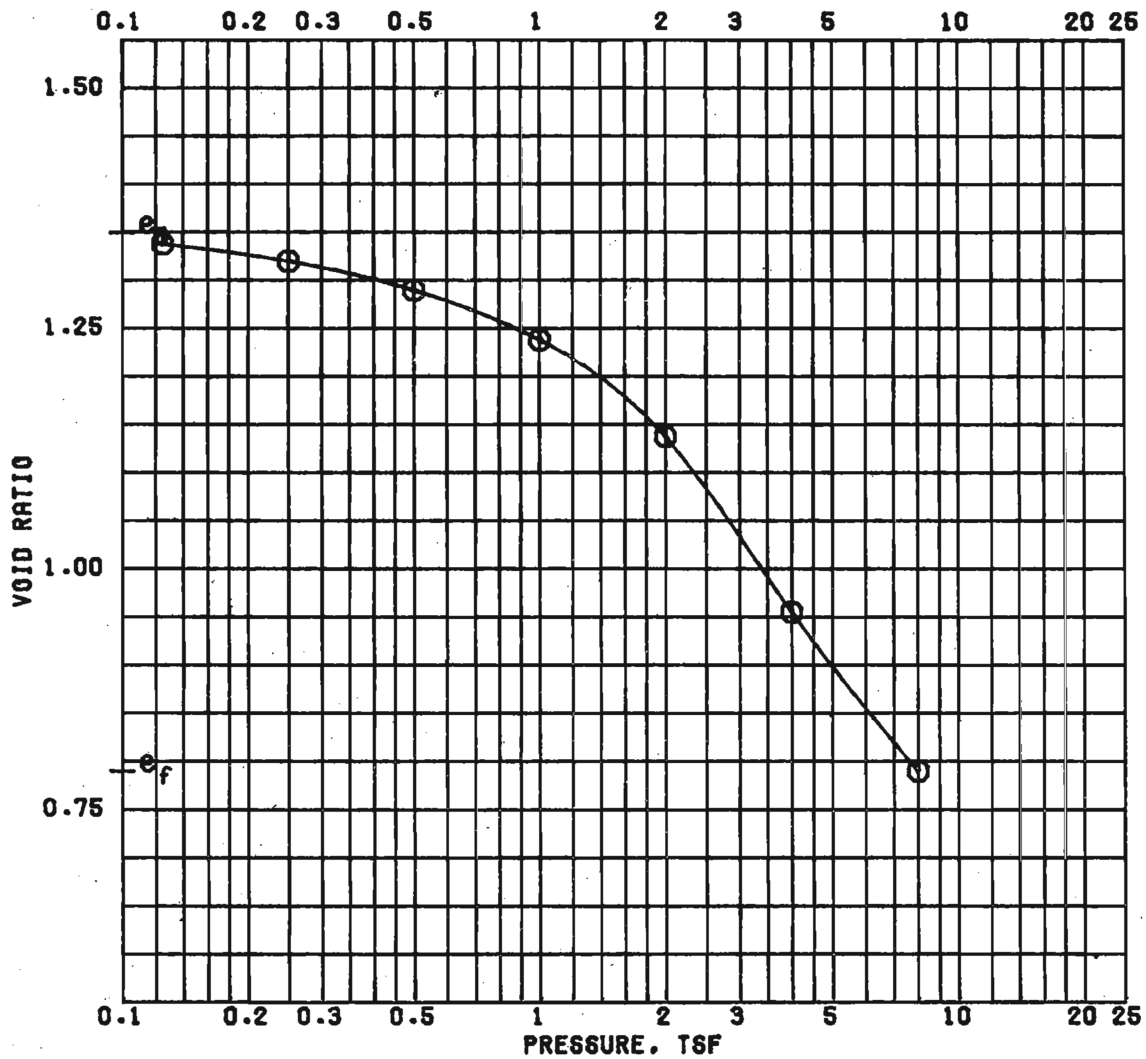
$\gamma sat. = 101$

			BEFORE TEST	AFTER TEST
OVERBURDEN PRESSURE, TSF		WATER CONTENT, %	62.5	36.6
PRECONSOL. PRESSURE, TSF	0.92	DRY DENSITY, PCF	61.7	85.9
COMPRESSION INDEX		SATURATION, %	97.6	100 +
TYPE SPECIMEN	UNDISTURBED	VOID RATIO	1.730	0.963
DIA. IN 4.44	HT. IN 1.115	BACK PRESSURE, TSF		

CLASSIFICATION PLASTIC CLAY (CH), GRAY; SILT LENSES			
LL	PL	PI	PROJECT LK. PONR. LA.& VIC. HURR. PROT.
GS 2.70 (EST)	D_{10}		ORLEANS PARISH OUTFALL CANALS
REMARKS			BORING NO. 1-OUO — SAMPLE NO. 11-B
			DEPTH/ELEV 40.2/-31.2 — DATE 20 SEP 84

CONSOLIDATION TEST REPORT

SHEET 1 OF 8



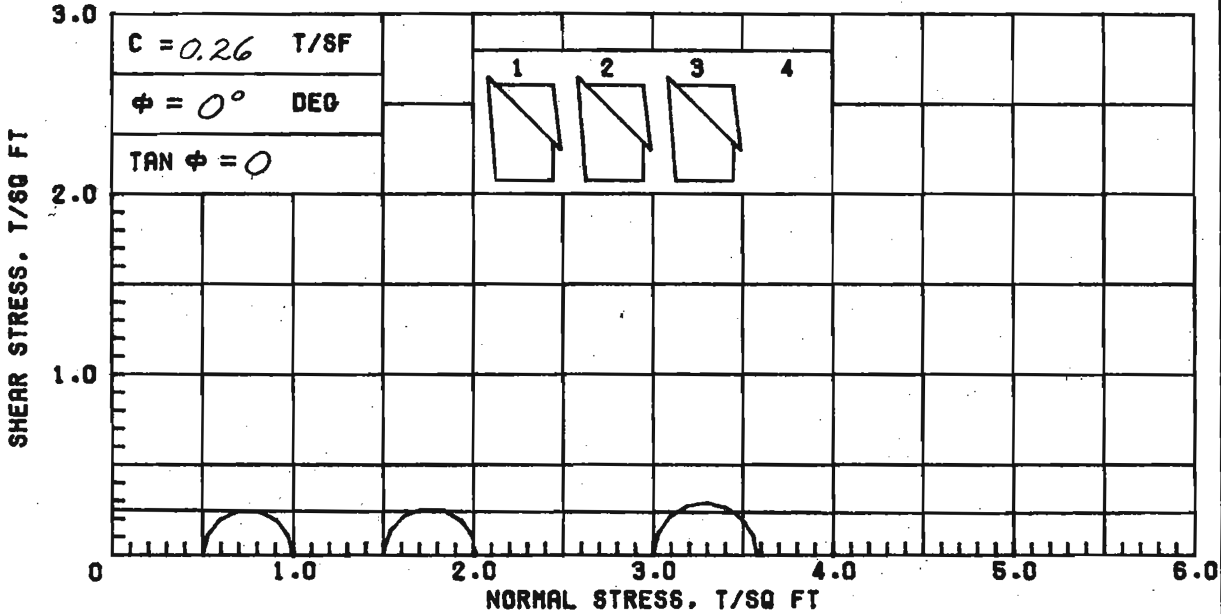
			BEFORE TEST	AFTER TEST
OVERBURDEN PRESSURE, TSF		WATER CONTENT, %	47.6	30.0
PRECONSOL. PRESSURE, TSF		DRY DENSITY, PCF	71.8	94.3
COMPRESSION INDEX		SATURATION, %	95.4	100 +
TYPE SPECIMEN	UNDISTURBED	VOID RATIO	1.348	0.788
DIA. IN 4.44	HT. IN 1.116	BACK PRESSURE, TSF		

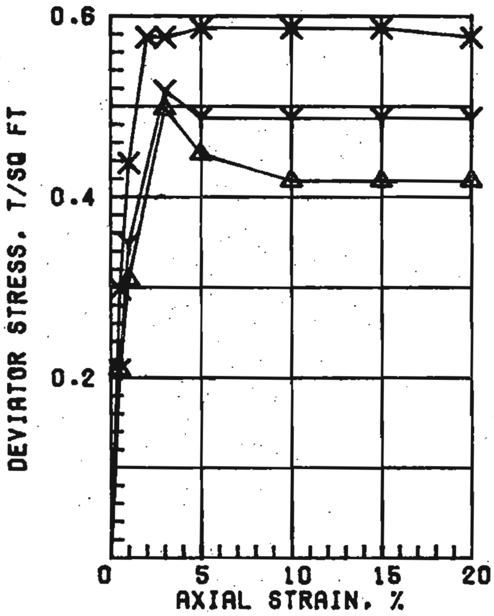
CLASSIFICATION PLASTIC CLAY (CH), GRAY; FINE SAND POCKETS; SHELL PARTICLES

LL	PL	PI	PROJECT LK. PONT. LA. & VIC. HURR. PROT.	
GS 2.70 (EST)	D_{10}		ORLEANS PARISH OUTFALL CANALS	
REMARKS			BORING NO. 3-LUG	SAMPLE NO. 14-C
			DEPTH/ELEV 53.4/-48.6	DATE 25 SEP 84

CONSOLIDATION TEST REPORT

SHEET 1 OF 9





SPECIMEN NO.		▲1	Y2	X3	4
		$\gamma_{sat.} = 111$			Avg
INITIAL	WATER CONTENT, %	41.2	41.1	42.3	41.5
	DRY DENSITY, PCF	78.0	78.3	77.2	
	SATURATION, %	95.8	96.3	96.5	
	VOID RATIO	1.161	1.152	1.183	
BEFORE SHEAR	WATER CONTENT, %				
	DRY DENSITY, PCF				
	SATURATION, %				
	VOID RATIO				
	BACK PRESS., TSF				
MIN PRIN. STRESS, TSF		0.5	1.5	3.0	
MAX. DEV. STRESS, TSF		0.50	0.52	0.58	
TIME TO FAILURE, MIN.		6	6	4	
RATE OF STRAIN INCR,%					
INITIAL DIAMETER, IN.		1.40	1.40	1.40	
INITIAL HEIGHT, IN.		3.00	3.00	3.00	

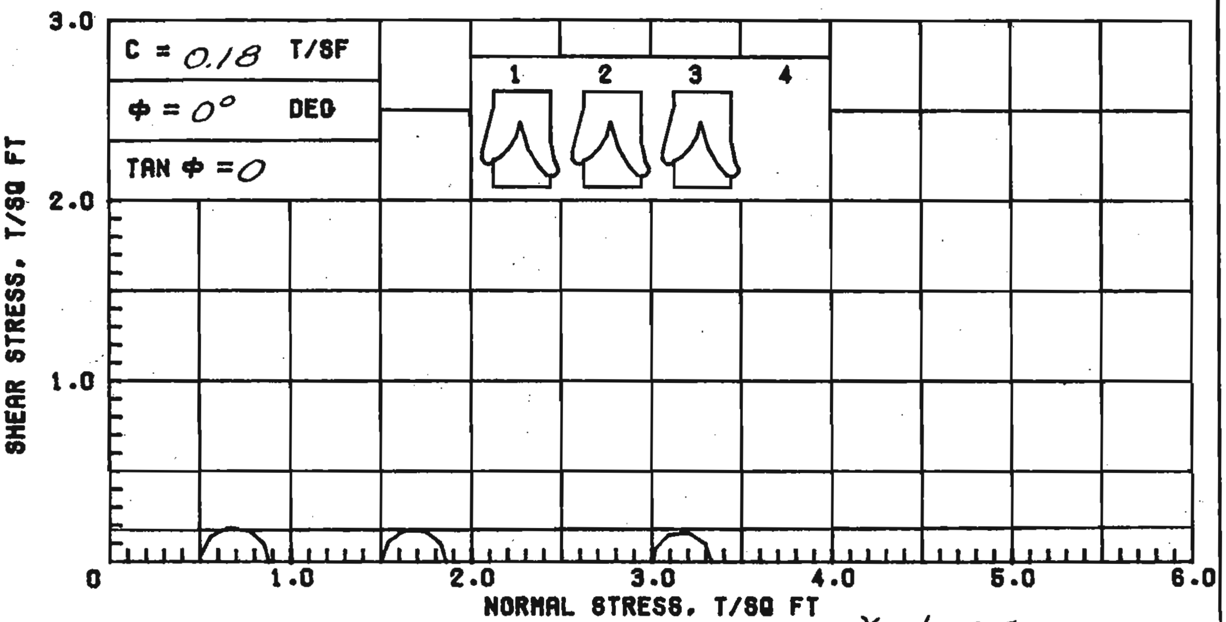
CONTROLLED-STRAIN TEST

DESCRIPTION OF SPECIMENS: PLASTIC CLAY (CH), GRAY & BROWN MOTTLED

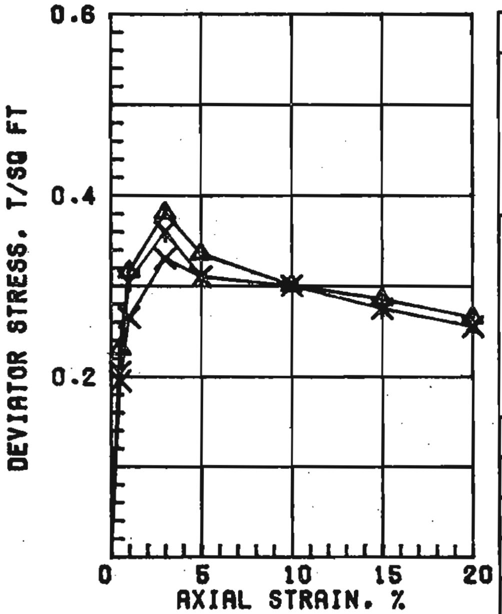
LL 55	PL 17	PI 38	GS 2.70 (ESTIMATED)	UNDISTURBED SPECIMEN	Q TEST

REMARKS:	
	PROJECT LK. PONT. LA. & VIC. HURR. PROT. ORLEANS PARISH OUTFALL CANALS
	BORING NO. 2-OUG — SAMPLE NO. 2-B
	DEPTH/ELEV 4.5/-0.8 — TECH. KOC
	LABORATORY USAE WES — DATE 17 SEP 84

TRIAXIAL COMPRESSION TEST REPORT



γsat. = 95



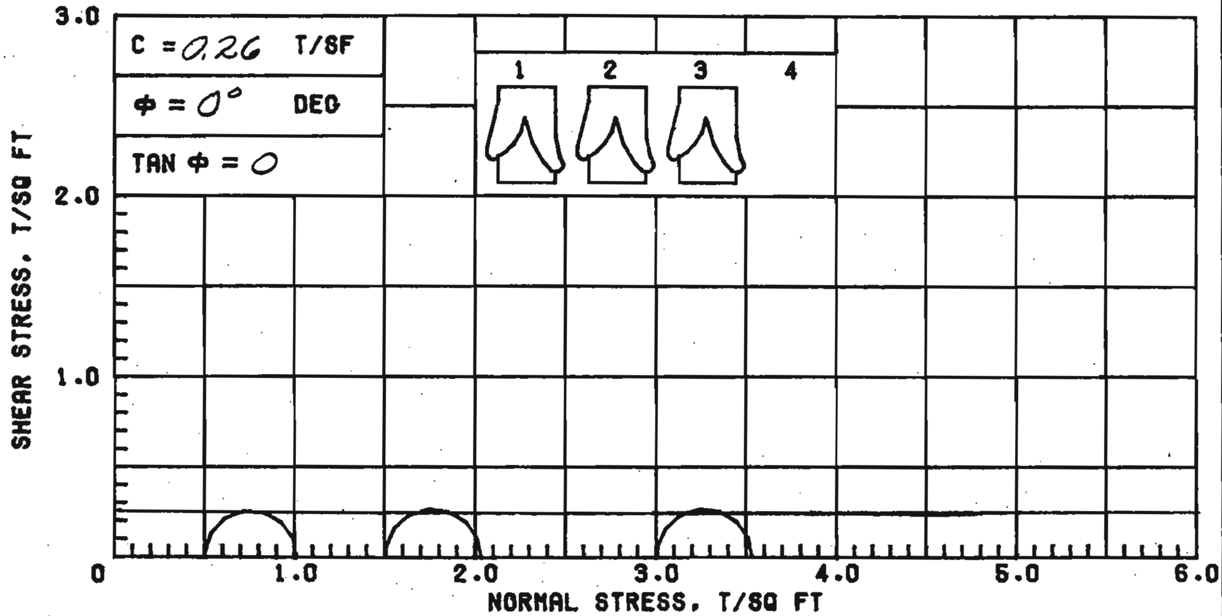
					Avg.
SPECIMEN NO.		▲1	Y2	X3	4
INITIAL	WATER CONTENT, %	83.8	84.5	84.4	84.2
	DRY DENSITY, PCF	51.3	51.2	51.2	
	SATURATION, %	99.0	99.6	99.6	
	VOID RATIO	2.285	2.292	2.289	
BEFORE SHEAR	WATER CONTENT, %				
	DRY DENSITY, PCF				
	SATURATION, %				
	VOID RATIO				
	BACK PRESS., TSF				
MIN PRIN. STRESS, TSF		0.5	1.5	3.0	
MAX. DEV. STRESS, TSF		0.38	0.36	0.33	
TIME TO FAILURE, MIN.		7	21	23	
RATE OF STRAIN INCR.%			5	8	
INITIAL DIAMETER, IN.		1.40	1.40	1.40	
INITIAL HEIGHT, IN.		3.00	3.00	3.00	

CONTROLLED-STRAIN TEST

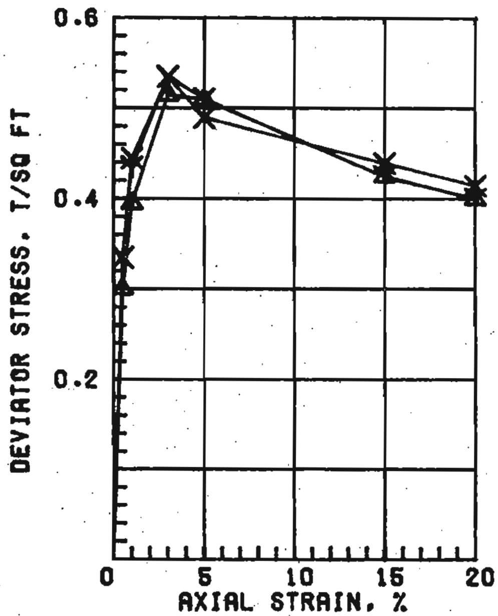
DESCRIPTION OF SPECIMENS: PLASTIC CLAY (CH), GRAY

LL 64	PL 26	PI 38	GS 2.70 (ESTIMATED)	UNDISTURBED SPECIMEN	Q TEST

REMARKS:	PROJECT LK. PONT. LA. & VIC. HURR. PROT.	
	ORLEANS PARISH OUTFALL CANALS	
	BORING NO. 2-OUG	SAMPLE NO. 3-B
	DEPTH/ELEV 8.1/-4.4	TECH. PJR
	LABORATORY USAE WES	DATE 18 SEP 84
	TRIAXIAL COMPRESSION TEST REPORT	



γsat. = 101



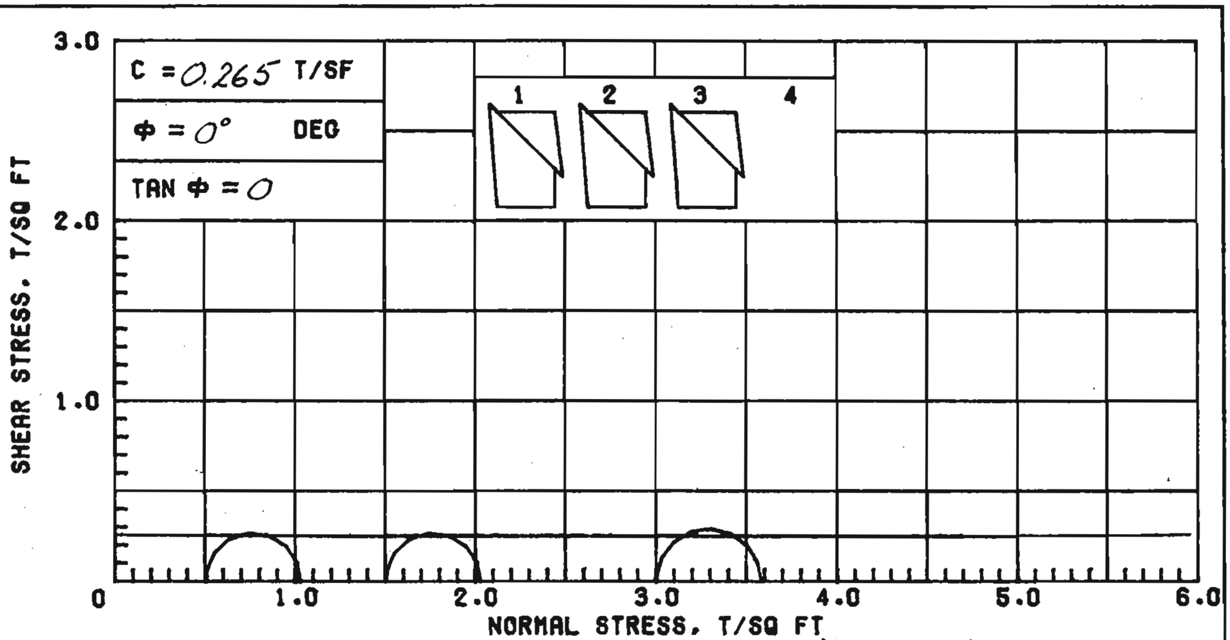
	SPECIMEN NO.	Δ1	Y2	X3	Avg. 4
INITIAL	WATER CONTENT, %	62.4	67.2	66.7	65.4
	DRY DENSITY, PCF	61.8	59.8	60.0	
	SATURATION, %	97.4	99.7	99.4	
	VOID RATIO	1.730	1.820	1.811	
BEFORE SHEAR	WATER CONTENT, %				
	DRY DENSITY, PCF				
	SATURATION, %				
	VOID RATIO				
	BACK PRESS., TSF				
	MIN PRIN. STRESS, TSF	0.5	1.5	3.0	
	MAX. DEV. STRESS, TSF	0.51	0.53	0.53	
	TIME TO FAILURE, MIN.	6	21	19	
	RATE OF STRAIN INCR.%		5	7	
	INITIAL DIAMETER, IN.	1.40	1.40	1.40	
	INITIAL HEIGHT, IN.	3.00	3.00	3.00	

CONTROLLED-STRAIN TEST

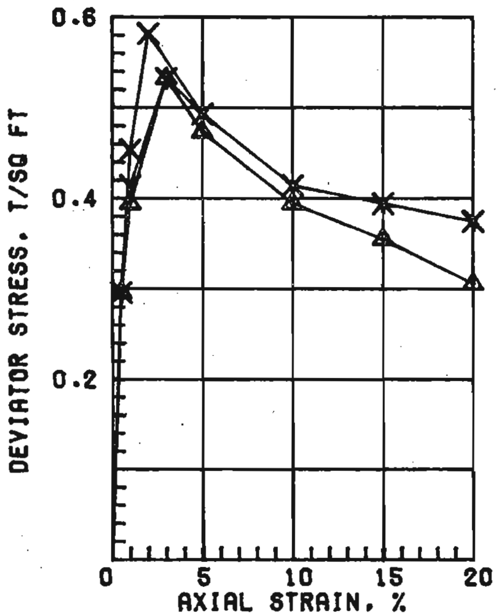
DESCRIPTION OF SPECIMENS: PLASTIC CLAY (CH), GRAY; SILT LENSES

LL 82	PL 23	PI 59	GS 2.70 (ESTIMATED)	UNDISTURBED SPECIMEN	Q TEST

REMARKS:	
	PROJECT LK. PONT. LA. & VIC. HURR. PROT.
	ORLEANS PARISH OUTFALL CANALS
	BORING NO. 2-OUG / SAMPLE NO. 8-B
	DEPTH/ELEV 28.1/-24.4 / TECH. PJR
	LABORATORY USAE WES / DATE 18 SEP 84
	TRIAXIAL COMPRESSION TEST REPORT



γsat.= 97



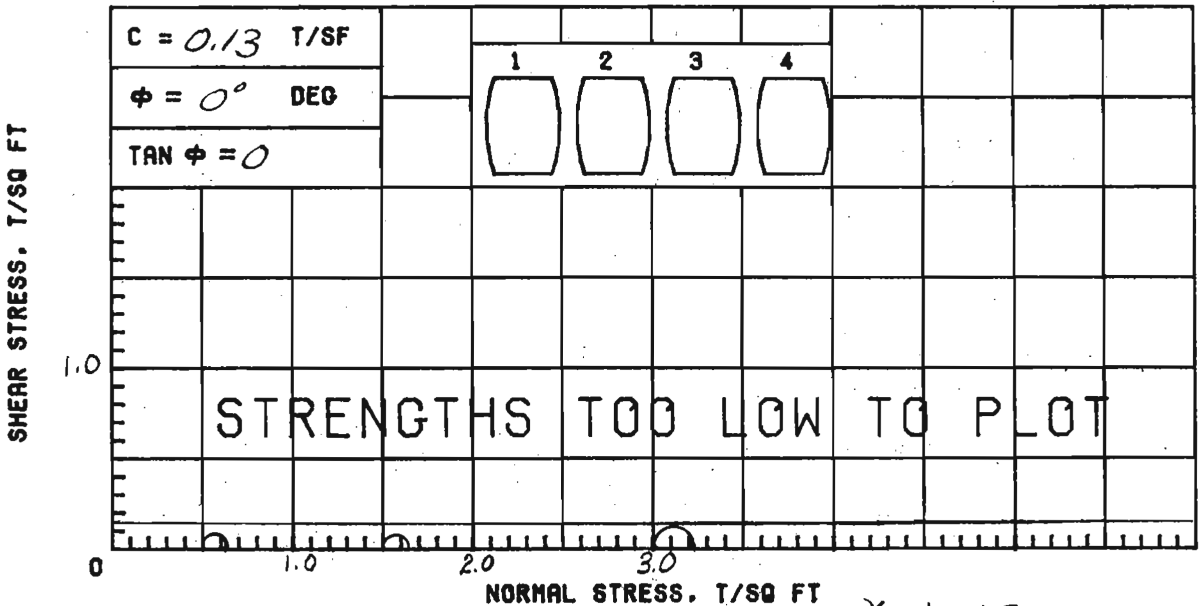
		△1	Y2	X3	4
	SPECIMEN NO.	△1	Y2	X3	4 (Avg.)
INITIAL	WATER CONTENT, %	74.3	74.9	74.9	74.7
INITIAL	DRY DENSITY, PCF	55.3	55.0	55.2	
INITIAL	SATURATION, %	98.0	97.9	98.6	
INITIAL	VOID RATIO	2.048	2.065	2.051	
BEFORE SHEAR	WATER CONTENT, %				
BEFORE SHEAR	DRY DENSITY, PCF				
BEFORE SHEAR	SATURATION, %				
BEFORE SHEAR	VOID RATIO				
BEFORE SHEAR	BACK PRESS., TSF				
	MIN PRIN. STRESS, TSF	0.5	1.5	3.0	
	MAX. DEV. STRESS, TSF	0.53	0.53	0.58	
	TIME TO FAILURE, MIN.	6	6	4	
	RATE OF STRAIN INCR.,%				
	INITIAL DIAMETER, IN.	1.41	1.41	1.41	
	INITIAL HEIGHT, IN.	3.00	3.00	3.00	

CONTROLLED-STRAIN TEST

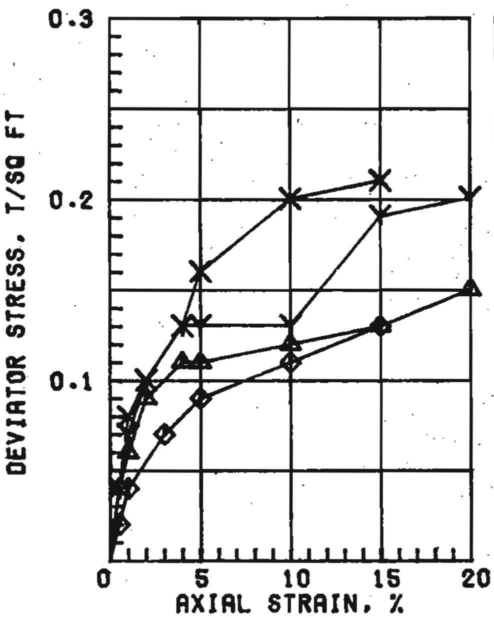
DESCRIPTION OF SPECIMENS: PLASTIC CLAY (CH), GRAY

LL	PL	PI	GS 2.70 (ESTIMATED)	UNDISTURBED SPECIMEN	Q TEST

REMARKS:	PROJECT LK. PONT. LA. & VIC. HURR. PROT. ORLEANS PARISH OUTFALL CANALS
	BORING NO. 2-OUG — SAMPLE NO. 9-B
	DEPTH/ELEV 32.2/-28.5 — TECH. KOC
	LABORATORY USAE WES — DATE 18 SEP 84
	TRIAXIAL COMPRESSION TEST REPORT



γsat. = 113



	SPECIMEN NO.	△1	Y2	X3	◇4	Avg.
INITIAL	WATER CONTENT, %	34.6	44.2	37.7	35.6	38.0
INITIAL	DRY DENSITY, PCF	82.8	74.2	80.9	82.9	
INITIAL	SATURATION, %	90.2	93.8	93.9	93.0	
INITIAL	VOID RATIO	1.036	1.273	1.084	1.034	
BEFORE SHEAR	WATER CONTENT, %					
BEFORE SHEAR	DRY DENSITY, PCF					
BEFORE SHEAR	SATURATION, %					
BEFORE SHEAR	VOID RATIO					
BEFORE SHEAR	BACK PRESS., TSF					
	MIN PRIN. STRESS, TSF	0.5	1.5	3.0	0.5	
	MAX. DEV. STRESS, TSF	0.11	0.13	0.21	0.13	
	TIME TO FAILURE, MIN.	8	8	30	30	
	RATE OF STRAIN INCR.,%					
	INITIAL DIAMETER, IN.	1.40	1.40	1.40	1.40	
	INITIAL HEIGHT, IN.	3.00	3.00	3.00	3.00	

CONTROLLED-STRAIN TEST

DESCRIPTION OF SPECIMENS: CLAY (CL), GRAY; SILT POCKETS & LENSES; SHELL PARTICLES

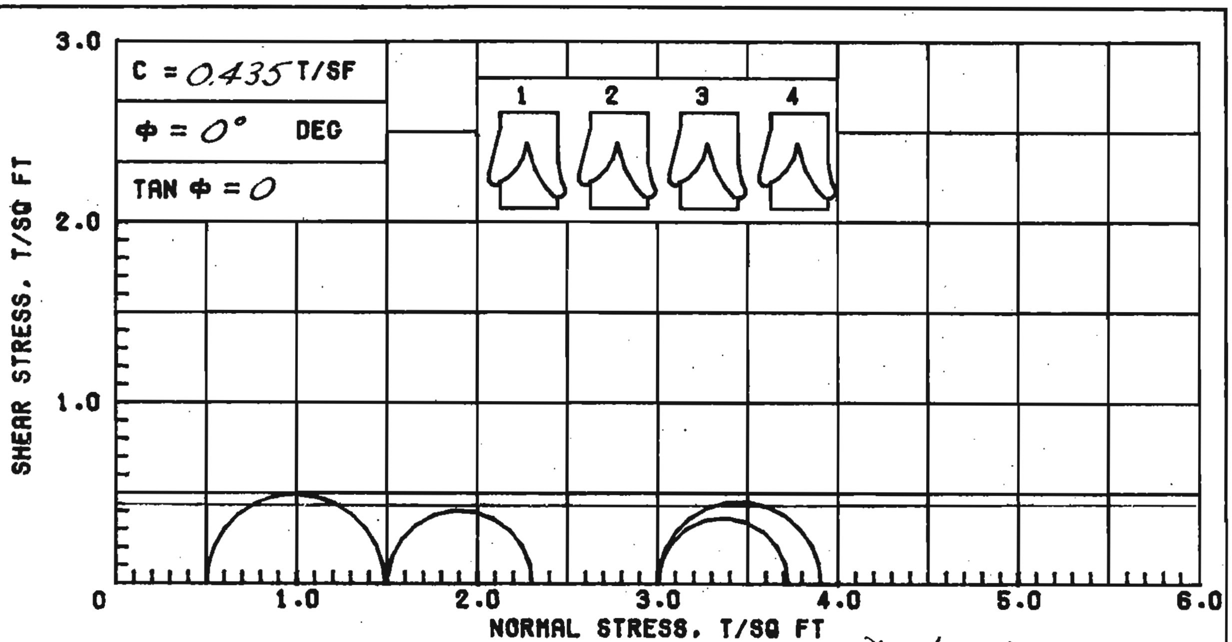
LL 39	PL 13	PI 26	GS 2.70 (ESTIMATED)	UNDISTURBED SPECIMEN	Q TEST

REMARKS:

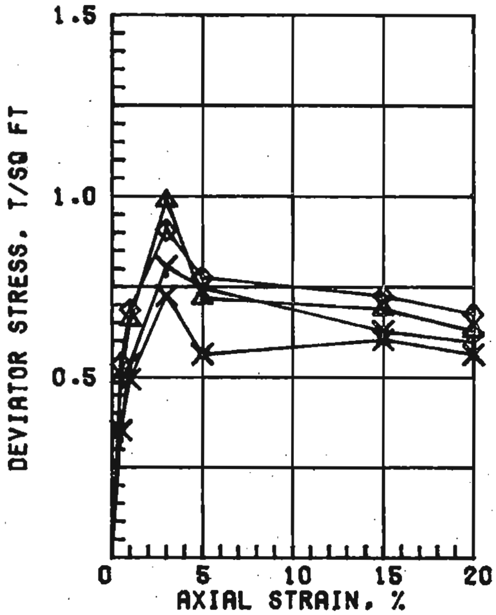
PROJECT LK. PONT. LA. & VIC. HURR. PROT.
ORLEANS PARISH OUTFALL CANALS

BORING NO. 2-OUG	SAMPLE NO. 10-B
DEPTH/ELEV 36.0/-32.3	TECH. KOC
LABORATORY USAE WES	DATE 18 SEP 84

TRIAXIAL COMPRESSION TEST REPORT



γsat = 101



SPECIMEN NO.		Δ1	Y2	X3	◇4	
INITIAL	WATER CONTENT, %	62.2	62.5	70.2	63.5	Avg. 64.6
	DRY DENSITY, PCF	61.9	61.8	58.1	61.9	
	SATURATION, %	97.4	97.6	99.8	99.6	
	VOID RATIO	1.725	1.729	1.899	1.722	
BEFORE SHEAR	WATER CONTENT, %					
	DRY DENSITY, PCF					
	SATURATION, %					
	VOID RATIO					
	BACK PRESS., TSF					
MIN PRIN. STRESS, TSF		0.5	1.5	3.0	3.0	
MAX. DEV. STRESS, TSF		0.99	0.81	0.73	0.91	
TIME TO FAILURE, MIN.		6	24	21	18	
RATE OF STRAIN INCR.%			5	7	5	
INITIAL DIAMETER, IN.		1.40	1.40	1.39	1.39	
INITIAL HEIGHT, IN.		3.00	3.00	3.00	3.00	

CONTROLLED-STRAIN TEST

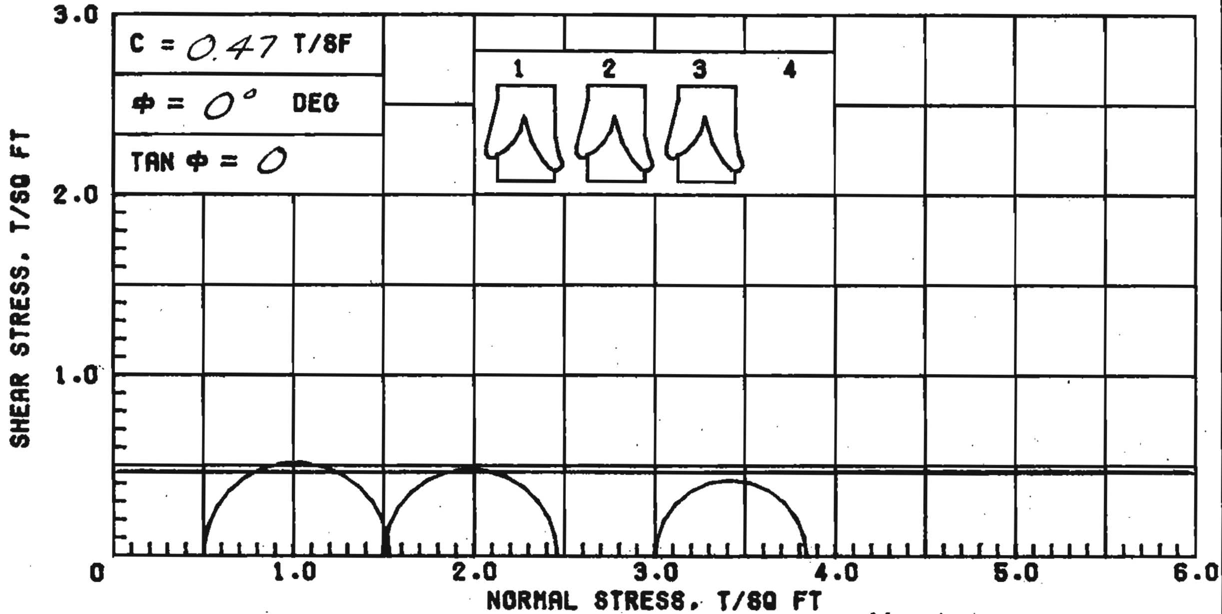
DESCRIPTION OF SPECIMENS: PLASTIC CLAY (CH), GRAY; SHELL PARTICLES; FISSURED

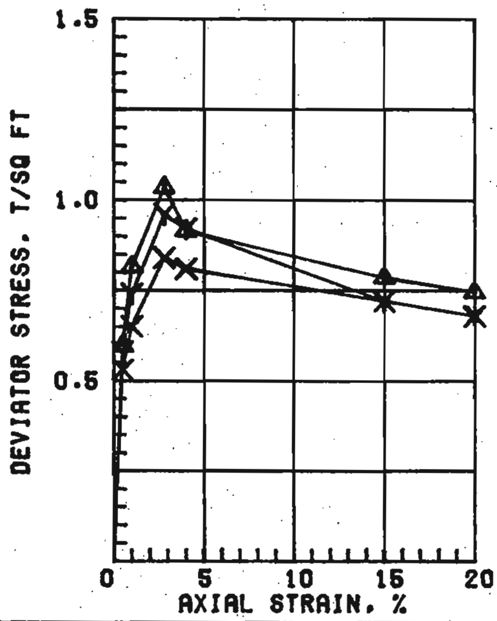
LL 81	PL 23	PI 58	GS 2.70 (ESTIMATED)	UNDISTURBED SPECIMEN	Q TEST

REMARKS:

PROJECT LK. PONT. LA. & VIC. HURR. PROT. ORLEANS PARISH OUTFALL CANALS	
BORING NO. 2-OUG	SAMPLE NO. 15-B
DEPTH/ELEV 55.7/-52.0	TECH. PJR
LABORATORY USAE WES	DATE 19 SEP 84

TRIAXIAL COMPRESSION TEST REPORT





γsat = 108

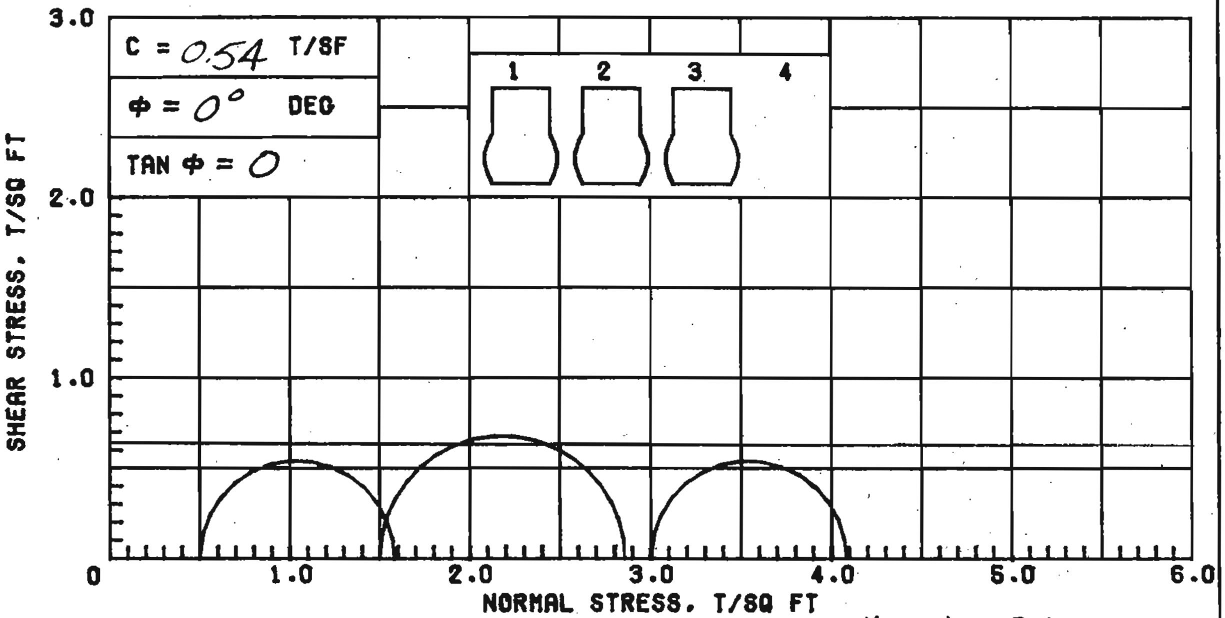
SPECIMEN NO.		Δ1	Y2	X3	4 Avg.
INITIAL	WATER CONTENT, %	48.1	49.8	50.8	49.6
	DRY DENSITY, PCF	72.6	71.4	70.9	
	SATURATION, %	98.2	98.9	99.5	
	VOID RATIO	1.323	1.359	1.379	
BEFORE SHEAR	WATER CONTENT, %				
	DRY DENSITY, PCF				
	SATURATION, %				
	VOID RATIO				
	BACK PRESS., TSF				
MIN PRIN. STRESS, TSF		0.5	1.5	3.0	
MAX. DEV. STRESS, TSF		1.03	0.96	0.84	
TIME TO FAILURE, MIN.		6	20	42	
RATE OF STRAIN INCR.%			5	4	
INITIAL DIAMETER, IN.		1.40	1.40	1.40	
INITIAL HEIGHT, IN.		3.00	3.00	3.00	

CONTROLLED-STRAIN TEST

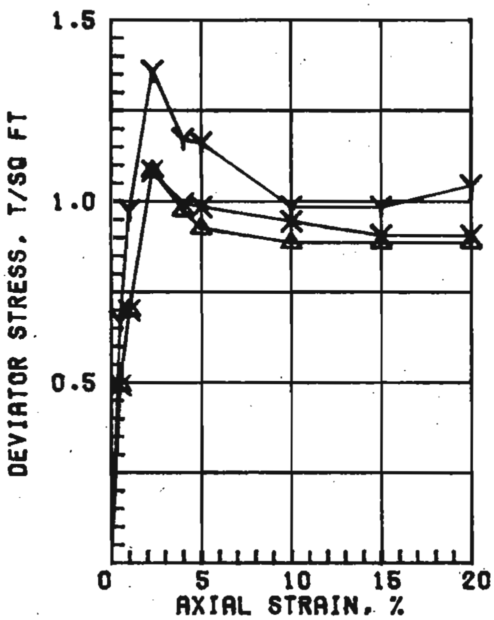
DESCRIPTION OF SPECIMENS: PLASTIC CLAY (CH), GRAY

LL 70	PL 21	PI 49	GS 2.70 (ESTIMATED)	UNDISTURBED SPECIMEN	Q TEST

REMARKS:		
	PROJECT LK. PONT. LA. & VIC. HURR. PROT. ORLEANS PARISH OUTFALL CANALS	
	BORING NO. 2-OUG	SAMPLE NO. 16-C
	DEPTH/ELEV 61.0/-57.3	TECH. PJR
	LABORATORY USAE WES	DATE 19 SEP 84
	TRIAXIAL COMPRESSION TEST REPORT	



γ sat. = 94 Avg.



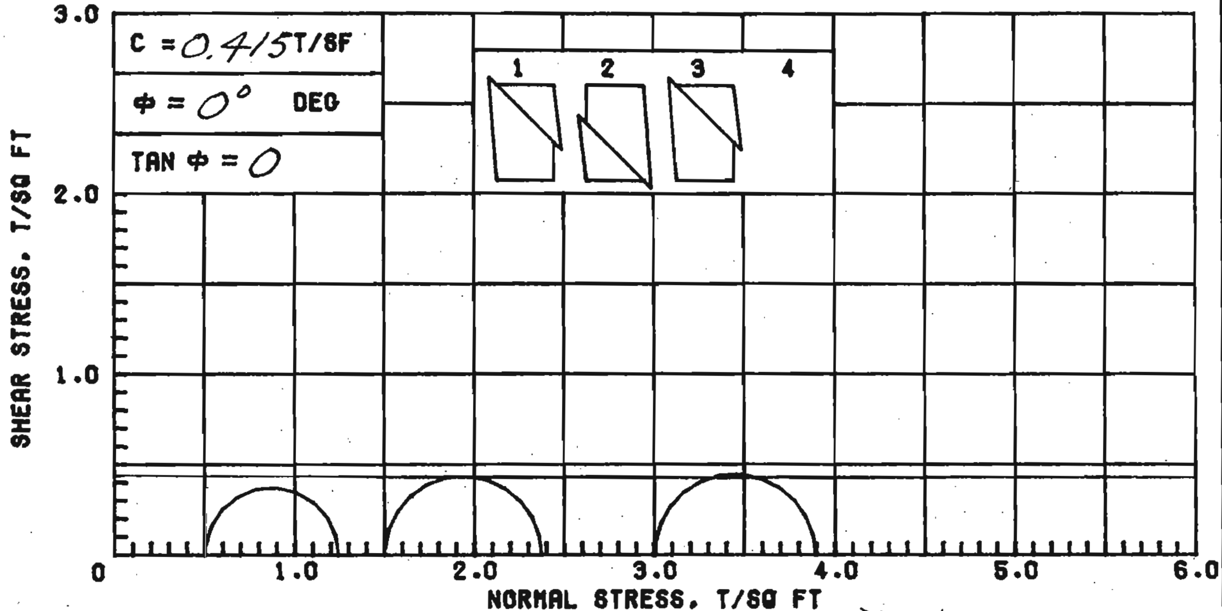
SPECIMEN NO.		Δ1	Y2	X3	4
INITIAL	WATER CONTENT, %	82.1	86.3	82.4	83.6
	DRY DENSITY, PCF	50.1	48.4	49.7	
	SATURATION, %	93.7	93.8	93.0	
	VOID RATIO	2.365	2.483	2.392	
BEFORE SHEAR	WATER CONTENT, %				
	DRY DENSITY, PCF				
	SATURATION, %				
	VOID RATIO				
	BACK PRESS., TSF				
MIN PRIN. STRESS, TSF		0.5	1.5	3.0	
MAX. DEV. STRESS, TSF		1.08	1.36	1.08	
TIME TO FAILURE, MIN.		5	5	5	
RATE OF STRAIN INCR,%					
INITIAL DIAMETER, IN.		1.41	1.41	1.41	
INITIAL HEIGHT, IN.		3.00	3.00	3.00	

CONTROLLED-STRAIN TEST

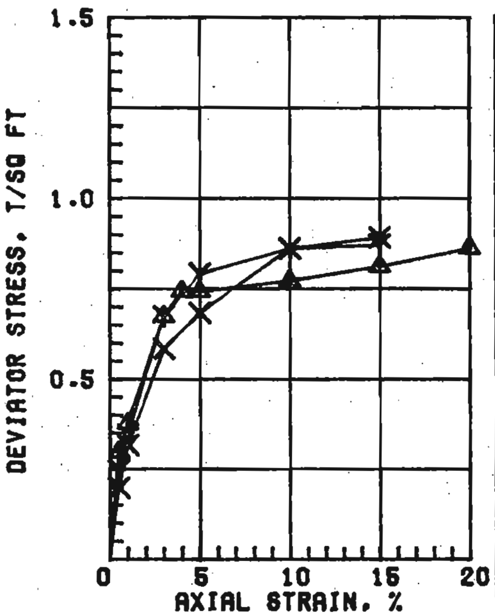
DESCRIPTION OF SPECIMENS: PLASTIC CLAY (CH), GRAY

LL 124	PL 30	PI 94	GS 2.70 (ESTIMATED)	UNDISTURBED SPECIMEN	Q TEST

REMARKS:	PROJECT LK. PONT. LA. & VIC. HURR. PROT.	
	ORLEANS PARISH OUTFALL CANALS	
	BORING NO. 2-OUG	SAMPLE NO. 17-C
	DEPTH/ELEV 65.0/-61.3	TECH. KOC
	LABORATORY USAE WES	DATE 19 SEP 84
	TRIAXIAL COMPRESSION TEST REPORT	



$\gamma sat. = 116$



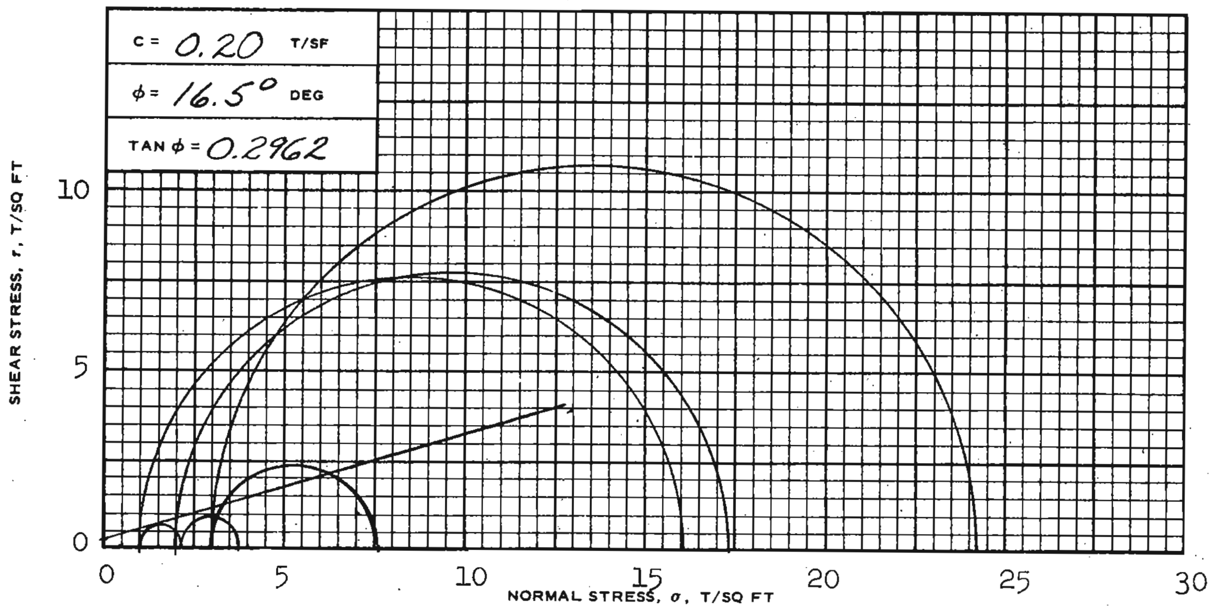
	SPECIMEN NO.	▲1	Y2	X3	4 Avg.
INITIAL	WATER CONTENT, %	35.6	34.2	34.0	34.6
	DRY DENSITY, PCF	84.8	85.8	85.5	
	SATURATION, %	97.2	95.7	94.6	
	VOID RATIO	0.989	0.965	0.971	
BEFORE SHEAR	WATER CONTENT, %				
	DRY DENSITY, PCF				
	SATURATION, %				
	VOID RATIO				
	BACK PRESS., TSF				
	MIN PRIN. STRESS, TSF	0.5	1.5	3.0	
	MAX. DEV. STRESS, TSF	0.74	0.87	0.89	
	TIME TO FAILURE, MIN.	6	30	30	
	RATE OF STRAIN INCR.,%				
	INITIAL DIAMETER, IN.	1.41	1.41	1.41	
	INITIAL HEIGHT, IN.	3.00	3.00	3.00	

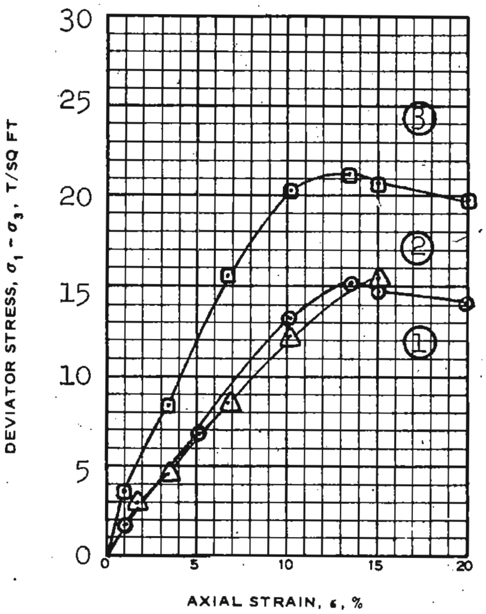
CONTROLLED-STRAIN TEST

DESCRIPTION OF SPECIMENS: PLASTIC CLAY (CH), GRAY; SILT LENSES

LL 52	PL 20	PI 32	GS 2.70 (ESTIMATED)	UNDISTURBED SPECIMEN	Q TEST

REMARKS:	PROJECT LK. PONT. LA. & VIC. HURR. PROT. ORLEANS PARISH OUTFALL CANALS	
	BORING NO. 2-OUG	SAMPLE NO. 20-B
	DEPTH/ELEV 76.4/-72.7	TECH. KOC
	LABORATORY USAE WES	DATE 19 SEP 84
	TRIAXIAL COMPRESSION TEST REPORT	





γsat = 121

SPECIMEN NO.			1	2	3	Avg.
INITIAL	WATER CONTENT, %	w_o	27.7	28.0	27.9	27.9
	DRY DENSITY LB/CU FT	γd_o	94.2	93.8	94.9	
	SATURATION, %	S_o	96.0	96.2	98.6	
	VOID RATIO	e_o	0.771	0.777	0.756	
BEFORE SHEAR	WATER CONTENT, %	w_c	29.8	29.2	29.2	
	DRY DENSITY LB/CU FT	γd_c	96.3	96.3	97.7	
	SATURATION, %	S_c	100+	100+	100+	
	VOID RATIO	e_c	0.730	0.730	0.706	
	FINAL BACK PRESSURE, T/SQ FT	u_o	4.32	4.32	4.32	
MINOR PRINCIPAL STRESS, T/SQ FT		σ_3	1.0	2.0	3.0	
MAXIMUM DEVIATOR STRESS, T/SQ FT		$(\sigma_1 - \sigma_3)_{MAX}$	15.09	15.36	21.08	
TIME TO $(\sigma_1 - \sigma_3)_{MAX}$, MIN		t_f	900	1000	893	
ULTIMATE DEVIATOR STRESS, T/SQ FT		$(\sigma_1 - \sigma_3)_{ULT}$	1.20	1.70	4.70	
INITIAL DIAMETER, IN.		D_o	1.41	1.37	1.37	
INITIAL HEIGHT, IN.		H_o	3.00	3.00	3.00	

CONTROLLED- STRAIN TEST

DESCRIPTION OF SPECIMENS SANDY SILT (ML), GRAY; SHELL PARTICLES

LL | PL | PI | Gs 2.67 (EST)

TYPE OF SPECIMEN UNDISTURBED | TYPE OF TEST R

REMARKS:

PROJECT LK. PONT. LA. & VIC. HURR. PROT. ORLEANS PARISH OUTFALL CANALS

BORING NO 2-OUG | SAMPLE NO. 6-C

DEPTH/ELEV 21.0/-17.3

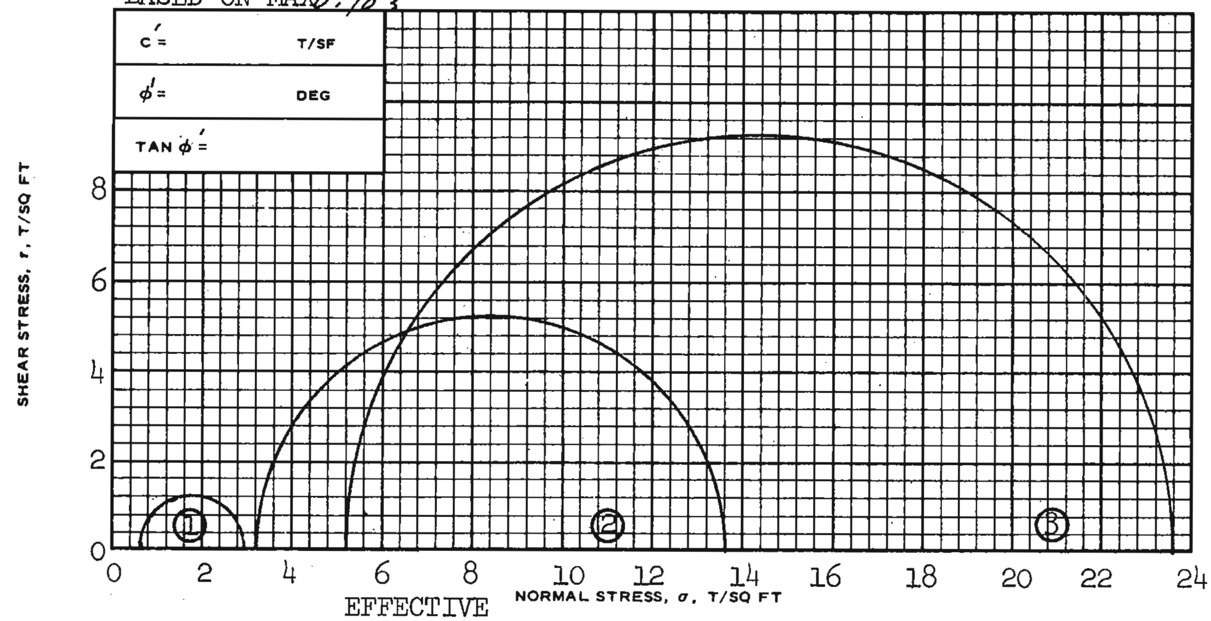
LABORATORY USAEWES | DATE 5 SEP 1984

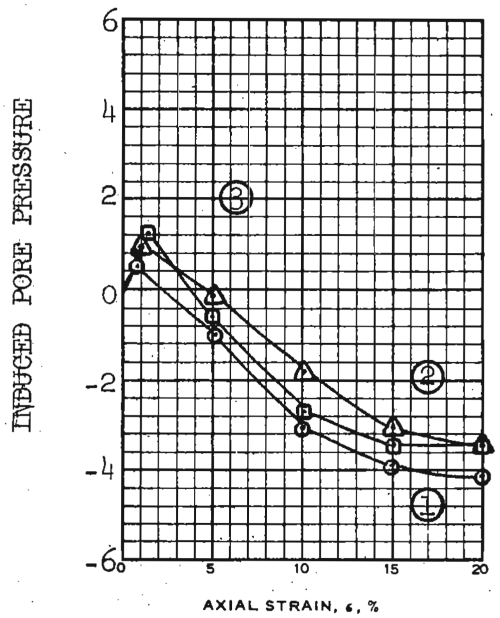
SHEET 1 OF 2

JMS **TRIAXIAL COMPRESSION TEST REPORT**

ENG FORM NO. 2089 PREVIOUS EDITION IS OBSOLETE
REV JUNE 1970

BASED ON MAX σ_1'/σ_3'





SPECIMEN NO.			1	2	3	
INITIAL	WATER CONTENT, %	w_o				
	DRY DENSITY LB/CU FT	γd_o				
	SATURATION, %	S_o				
	VOID RATIO	e_o				
BEFORE SHEAR	WATER CONTENT, %	w_c				
	DRY DENSITY LB/CU FT	γd_c				
	SATURATION, %	S_c				
	VOID RATIO	e_c				
	FINAL BACK PRESSURE, T/SQ FT	u_o				
MINOR PRINCIPAL STRESS, T/SQ FT		σ_3	0.63	3.22	5.21	
MAXIMUM DEVIATOR STRESS, T/SQ FT		$(\sigma_1 - \sigma_3)_{MAX}$	2.31	10.43	18.38	
TIME TO $(\sigma_1 - \sigma_3)_{MAX}$, MIN		t_f				
ULTIMATE DEVIATOR STRESS, T/SQ FT		$(\sigma_1 - \sigma_3)_{ULT}$				
INITIAL DIAMETER, IN.		D_o				
INITIAL HEIGHT, IN.		H_o				

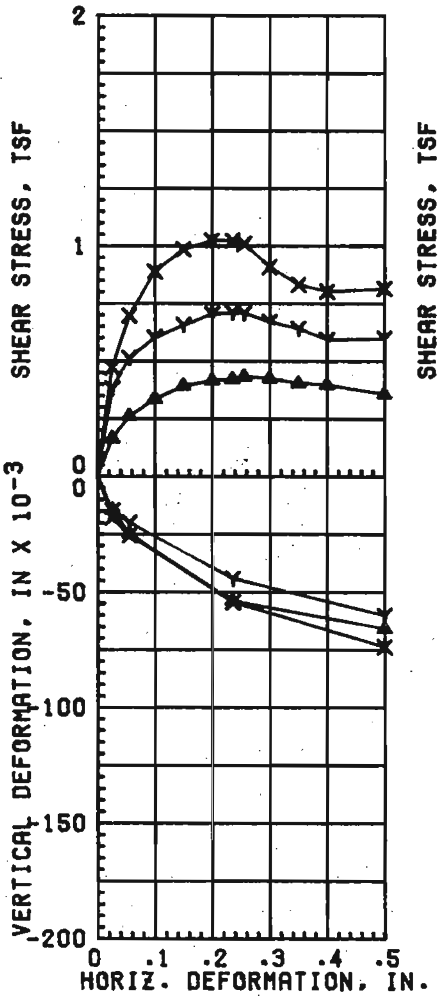
CONTROLLED- TEST

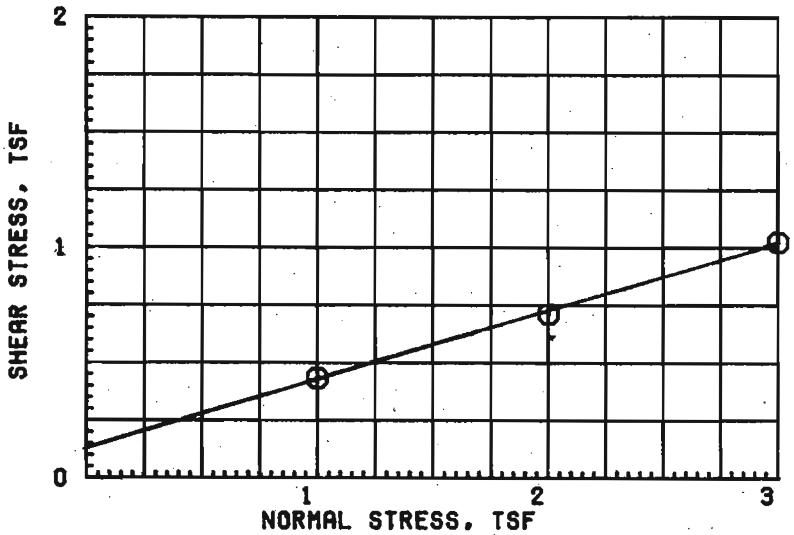
DESCRIPTION OF SPECIMENS

LL	PL	PI	Gs	TYPE OF SPECIMEN	TYPE OF TEST

REMARKS:	PROJECT LK. PONT. LA. & VIC. HURR. PROT. ORLEANS PARISH OUTFALL CANALS
	BORING NO. 2-OUG — SAMPLE NO. 6-C
	DEPTH/ELEV 21.0/-17.3
	LABORATORY USAEWES — DATE 5 SEP 1984
SHEET 2 OF2	JMS **TRIAXIAL COMPRESSION TEST REPORT**

ENG FORM NO. 2089 REV JUNE 1970 PREVIOUS EDITION IS OBSOLETE





$\gamma_{sat.} = 94$

		TEST NO.	1 ▲	2 Y	3 X	Avg.
INITAL		WATER CONTENT, %	87.9	90.2	85.8	88
		VOID RATIO	2.427	2.425	2.335	
		SATURATION, %	97.8	100 +	99.2	
		DRY DENSITY, PCF	49.2	49.2	50.5	
VOID RATIO AFTER CONSOL						
FIFTY PERCENT CONSOL, MIN			12	40	25	
FINAL		WATER CONTENT, %	62.6	51.1	49.7	
		VOID RATIO				
		SATURATION, %				
NORMAL STRESS, TSF			1.0	2.0	3.0	
MAXIMUM SHEAR STRESS, TSF			0.43	0.71	1.02	
TIME TO FAILURE, MIN			1380	1273	1080	
RATE OF STRAIN, IN/MIN			.00019	.00019	.00019	
ULTIMATE SHEAR STRESS, TSF						

$\Phi = 16.5^{o}$

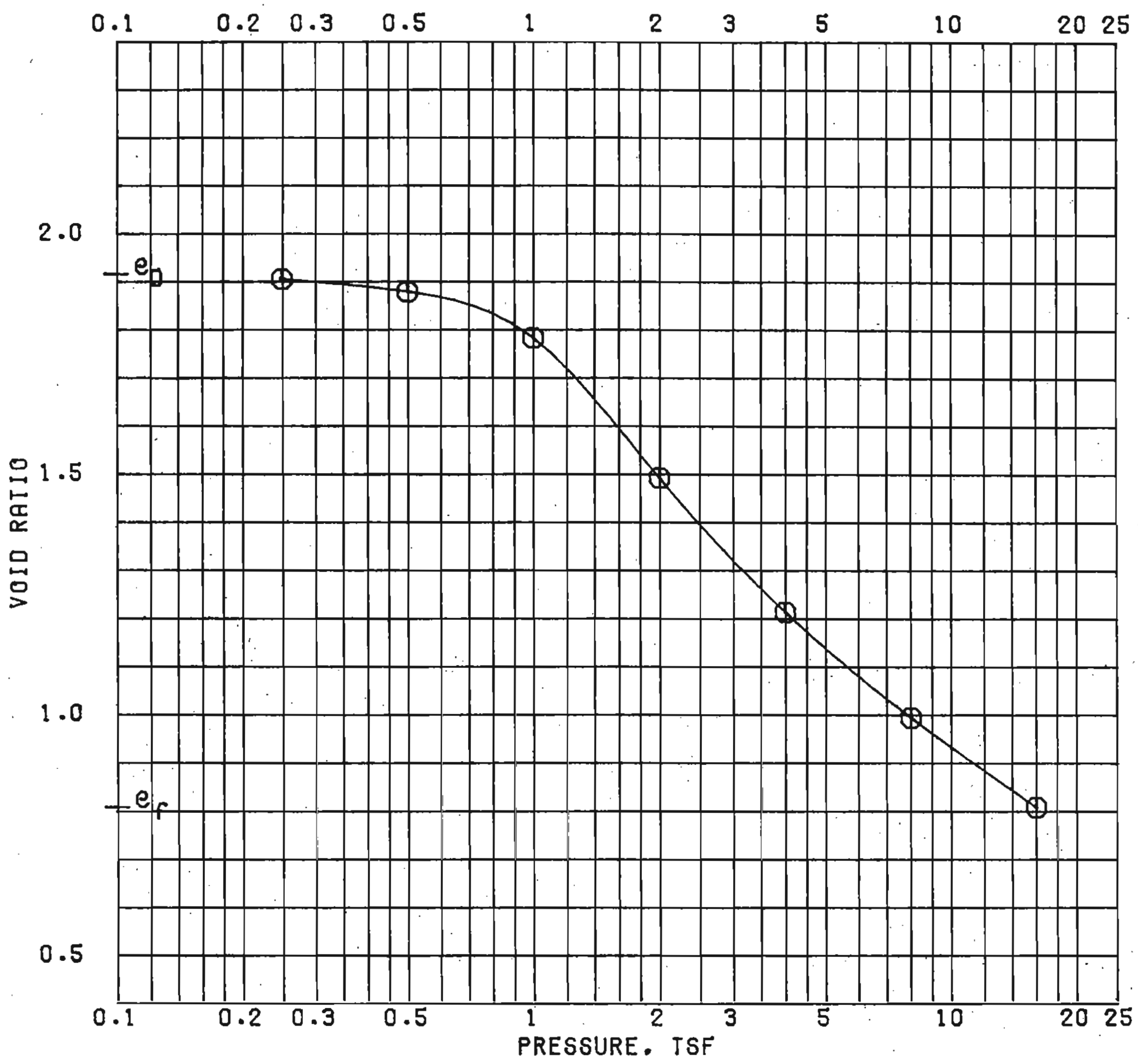
TAN $\Phi = 0.2962$

C = 0.125

TYPE SPECIMEN UNDISTURBED	3.00 IN. SQUARE	0.756 IN. THICK
CLASSIFICATION PLASTIC CLAY (CH), GRAY		

LL	PL	PI		GS 2.70 (EST)

REMARKS:	PROJECT LAKE PONT. LA. & VIC. HURR. PROT.	
	ORLEANS PARISH OUTFALL CANALS	
	BORING NO. 2-OUG	SAMPLE 3-C
	DEPTH/ELEV 9.3/-5.6	DATE 09 OCT 84
	DIRECT SHEAR TEST REPORT	



$\gamma_{sat.} = 99$

			BEFORE TEST	AFTER TEST
OVERBURDEN PRESSURE, TSF		WATER CONTENT, %	68.9	32.9
PRECONSOL. PRESSURE, TSF	0.82	DRY DENSITY, PCF	57.9	93.4
COMPRESSION INDEX		SATURATION, %	97.3	100 +
TYPE SPECIMEN	UNDISTURBED	VOID RATIO	1.912	0.805
DIA. IN 4.44	HT. IN 1.126	BACK PRESSURE, TSF		

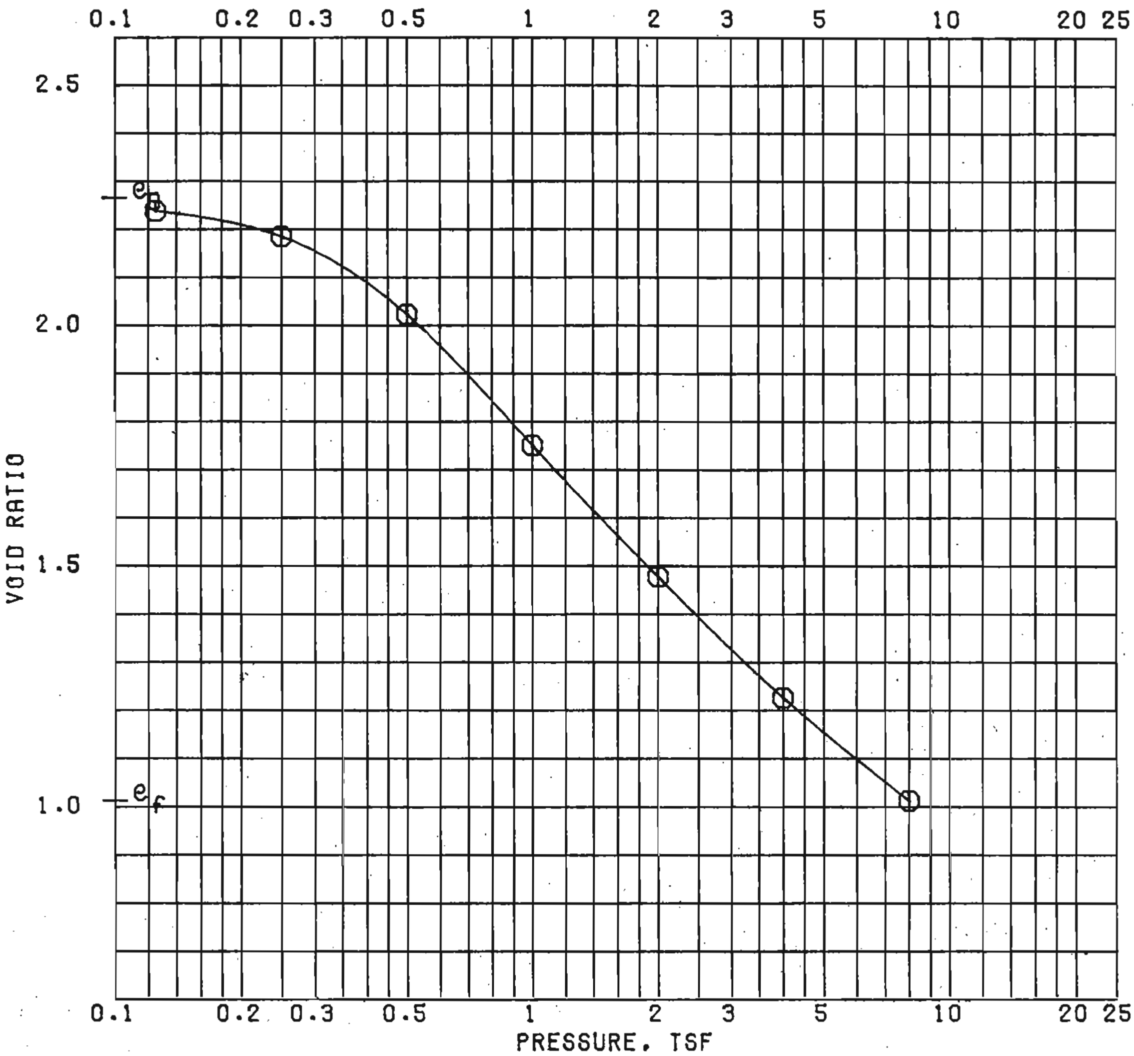
CLASSIFICATION PLASTIC CLAY (CH), GRAY; FINE SAND LENSES

LL	PL	PI	PROJECT LK. PONT. LA. & VIC. HURR. PROT.
GS 2.70 (EST)	D_{10}		ORLEANS PARISH OUTFALL CANALS

REMARKS	BORING NO. 2-OUG	SAMPLE NO. 8-C
	DEPTH/ELEV 29.0/-25.3	DATE 03 OCT 84

CONSOLIDATION TEST REPORT

SHEET 1 OF 9

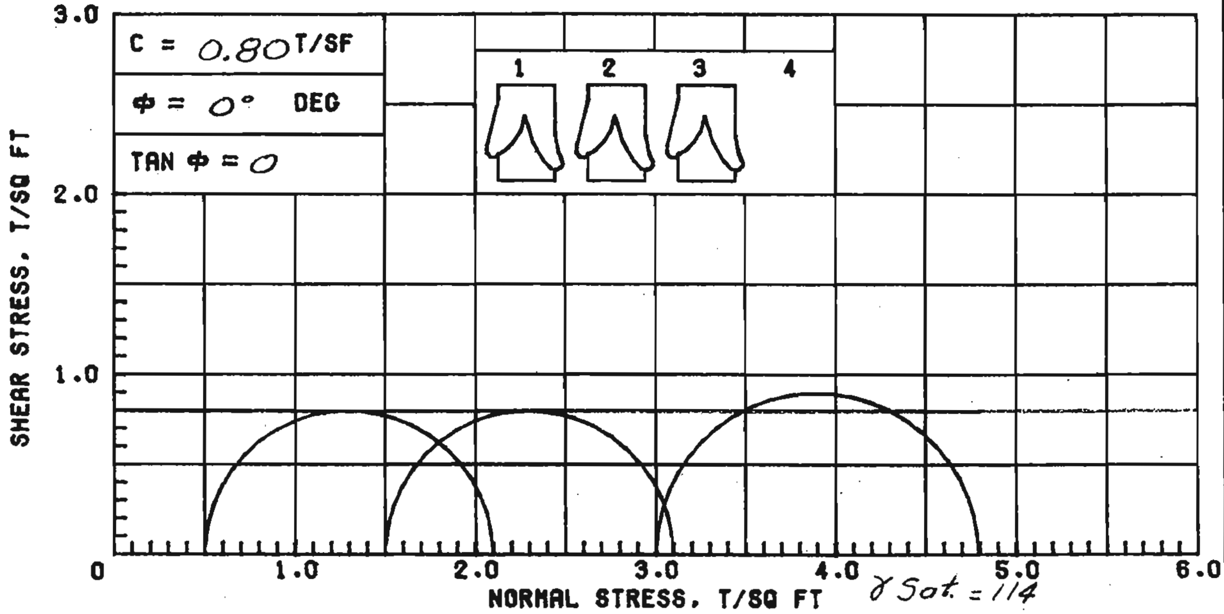


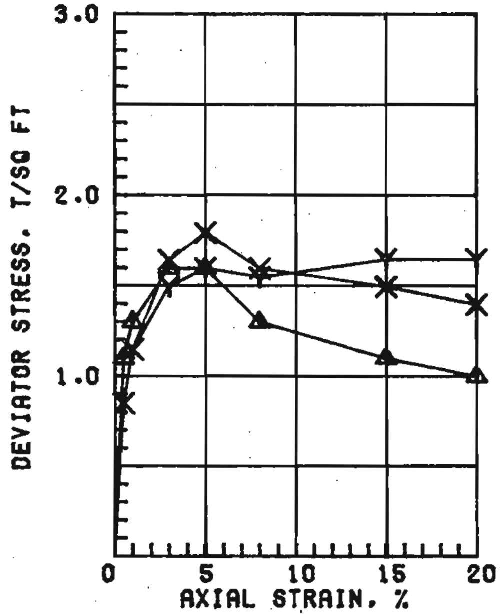
$\gamma_{sat} = 95$

			BEFORE TEST	AFTER TEST
OVERBURDEN PRESSURE, TSF		WATER CONTENT, %	80.2	40.7
PRECONSOL. PRESSURE, TSF	0.34	DRY DENSITY, PCF	51.7	83.9
COMPRESSION INDEX		SATURATION, %	95.8	100 +
TYPE SPECIMEN	UNDISTURBED	VOID RATIO	2.262	1.009
DIA. IN 4.44	HT. IN 1.117	BACK PRESSURE, TSF		

CLASSIFICATION PLASTIC CLAY (CH), GRAY			
LL	PL	PI	PROJECT LK. PONT. LA. & VIC. HURR. PROT.
GS 2.70 (EST)	D_{10}		ORLEANS PARISH OUTFALL CANALS
REMARKS		BORING NO. 2-OUG	SAMPLE NO. 3-D
		DEPTH/ELEV 10.2/-6.5	DATE 04 OCT 84
		CONSOLIDATION TEST REPORT	

SHEET 1 OF 9





	SPECIMEN NO.	Δ1	Y2	X3	Avg. 4
INITIAL	WATER CONTENT, %	38.1	39.0	38.4	38.5
	DRY DENSITY, PCF	81.6	81.0	81.2	
	SATURATION, %	96.5	97.3	96.5	
	VOID RATIO	1.067	1.082	1.075	
BEFORE SHEAR	WATER CONTENT, %				
	DRY DENSITY, PCF				
	SATURATION, %				
	VOID RATIO				
	BACK PRESS., TSF				
	MIN PRIN. STRESS, TSF	0.5	1.5	3.0	
	MAX. DEV. STRESS, TSF	1.60	1.60	1.79	
	TIME TO FAILURE, MIN.	7	34	22	
	RATE OF STRAIN INCR.,%		8	8	
	INITIAL DIAMETER, IN.	1.40	1.40	1.40	
	INITIAL HEIGHT, IN.	3.00	3.00	3.00	

CONTROLLED-STRAIN TEST

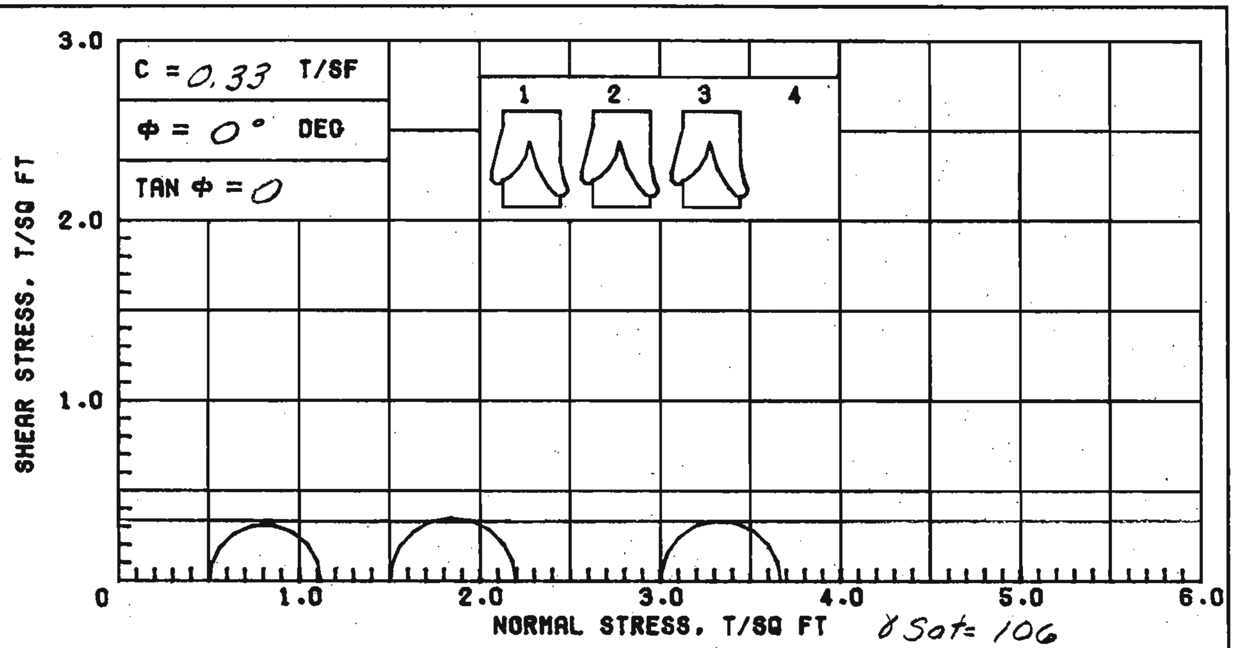
DESCRIPTION OF SPECIMENS: PLASTIC CLAY (CH), BROWN

LL 74	PL 23	PI 51	GS 2.70 (ESTIMATED)	UNDISTURBED SPECIMEN	Q TEST

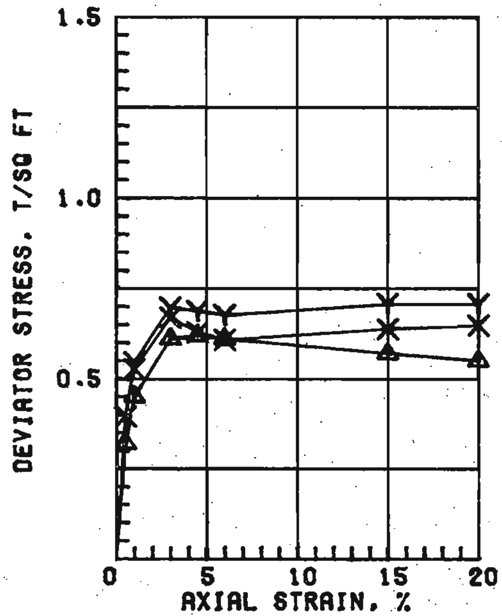
REMARKS:

PROJECT LK. PONT. LA. & VIC. HURR. PROT. ORLEANS PARISH OUTFALL CANALS	
BORING NO. 3-OUG	SAMPLE NO. 1-C
DEPTH/ELEV 2.0/+2.4	TECH. PJR
LABORATORY USAE WES	DATE 20 SEP 84

TRIAXIAL COMPRESSION TEST REPORT



γ Sat = 106



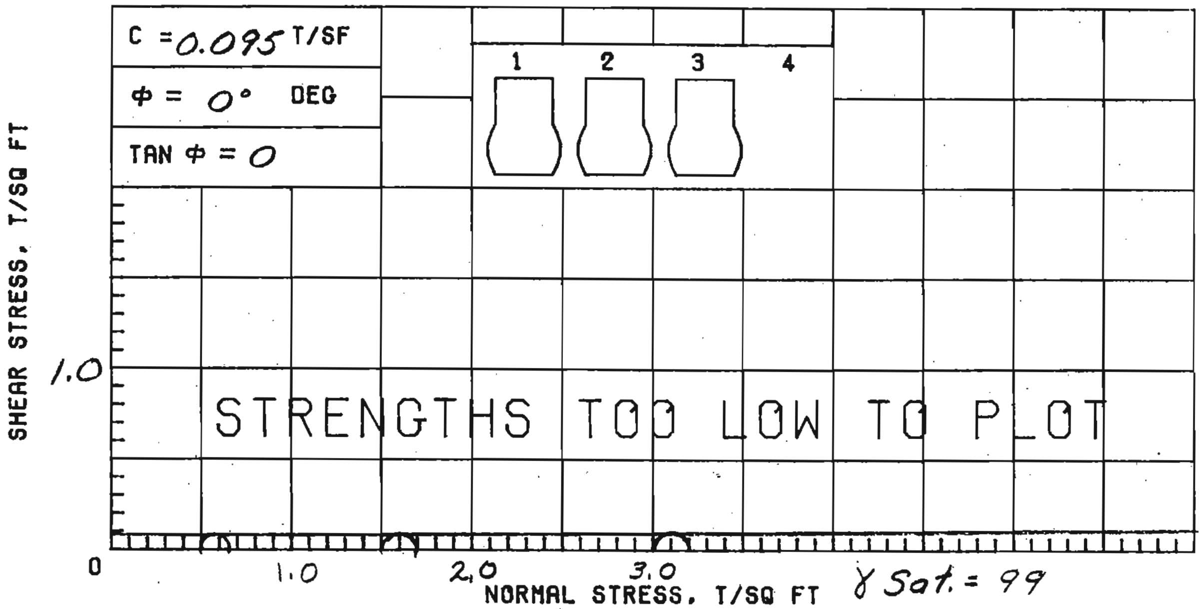
	SPECIMEN NO.	▲1	Y2	X3	4 (Avg.)
INITIAL	WATER CONTENT, %	50.8	51.9	52.6	51.8
	DRY DENSITY, PCF	70.2	69.6	69.2	
	SATURATION, %	97.9	98.5	98.9	
	VOID RATIO	1.401	1.422	1.437	
BEFORE SHEAR	WATER CONTENT, %				
	DRY DENSITY, PCF				
	SATURATION, %				
	VOID RATIO				
	BACK PRESS., TSF				
	MIN PRIN. STRESS, TSF	0.5	1.5	3.0	
	MAX. DEV. STRESS, TSF	0.62	0.70	0.67	
	TIME TO FAILURE, MIN.	9	20	30	
	RATE OF STRAIN INCR.%		6	6	
	INITIAL DIAMETER, IN.	1.40	1.39	1.39	
	INITIAL HEIGHT, IN.	3.00	3.00	3.00	

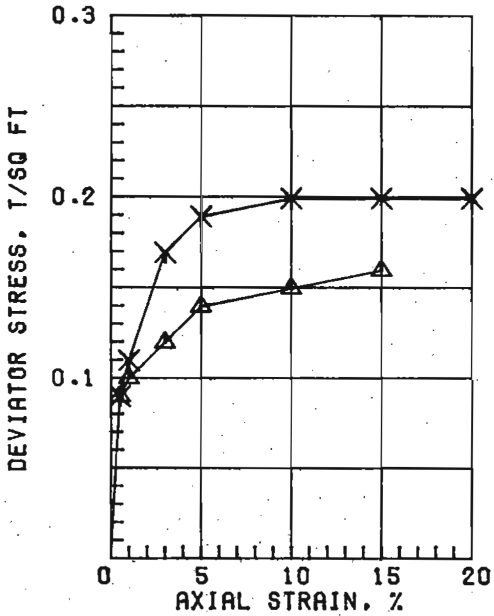
CONTROLLED-STRAIN TEST

DESCRIPTION OF SPECIMENS; PLASTIC CLAY (CH), BROWN; SILT LENSES

LL 72	PL 24	PI 48	GS 2.70 (ESTIMATED)	UNDISTURBED SPECIMEN	Q TEST

REMARKS;	PROJECT LK. PONT. LA. & VIC. HURR. PROT.	
	ORLEANS PARISH OUTFALL CANALS	
	BORING NO. 3-OUO	SAMPLE NO. 2-B
	DEPTH/ELEV 4.5/-0.1	TECH. PJR
	LABORATORY USAE WES	DATE 20 SEP 84
	TRIAXIAL COMPRESSION TEST REPORT	





		△1	Y2	X3	Avg. 4
SPECIMEN NO.		△1	Y2	X3	Avg. 4
INITIAL	WATER CONTENT, %	71.1	69.3	69.8	70.1
	DRY DENSITY, PCF	57.0	58.2	57.8	
	SATURATION, %	98.2	98.7	98.5	
	VOID RATIO	1.955	1.895	1.914	
BEFORE SHEAR	WATER CONTENT, %				
	DRY DENSITY, PCF				
	SATURATION, %				
	VOID RATIO				
	BACK PRESS., TSF				
MIN PRIN. STRESS, TSF		0.5	1.5	3.0	
MAX. DEV. STRESS, TSF		0.16	0.20	0.20	
TIME TO FAILURE, MIN.		30	20	20	
RATE OF STRAIN INCR,%					
INITIAL DIAMETER, IN.		1.40	1.40	1.40	
INITIAL HEIGHT, IN.		3.00	3.00	3.00	

CONTROLLED-STRAIN TEST

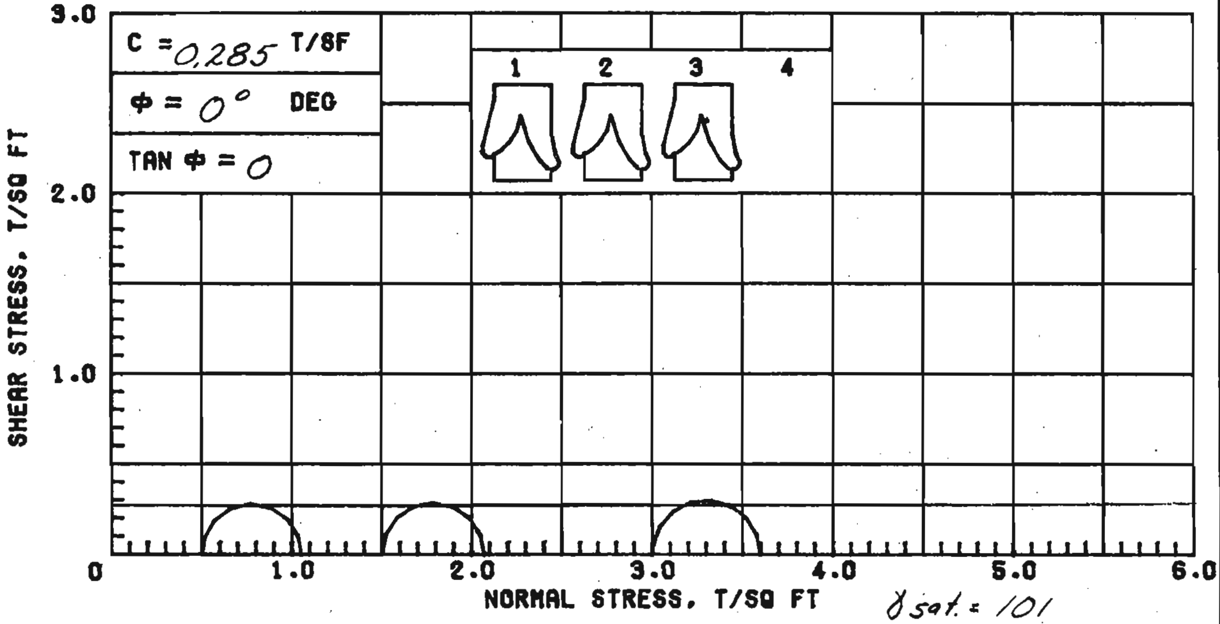
DESCRIPTION OF SPECIMENS: PLASTIC CLAY (CH), GRAY

LL 87	PL 25	PI 62	GS 2.70 (ESTIMATED)	UNDISTURBED SPECIMEN	Q TEST

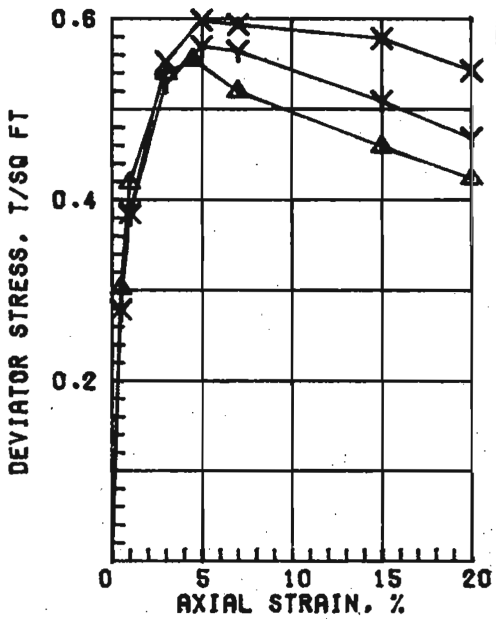
REMARKS:

PROJECT LK. PONT. LA. & VIC. HURR. PROT. ORLEANS PARISH OUTFALL CANALS	
BORING NO. 3-OUG	SAMPLE NO. 3-B
DEPTH/ELEV 8.0/-3.6	TECH. KOC
LABORATORY USAE WES	DATE 20 SEP 84

TRIAXIAL COMPRESSION TEST REPORT



$\gamma_{sat} = 101$



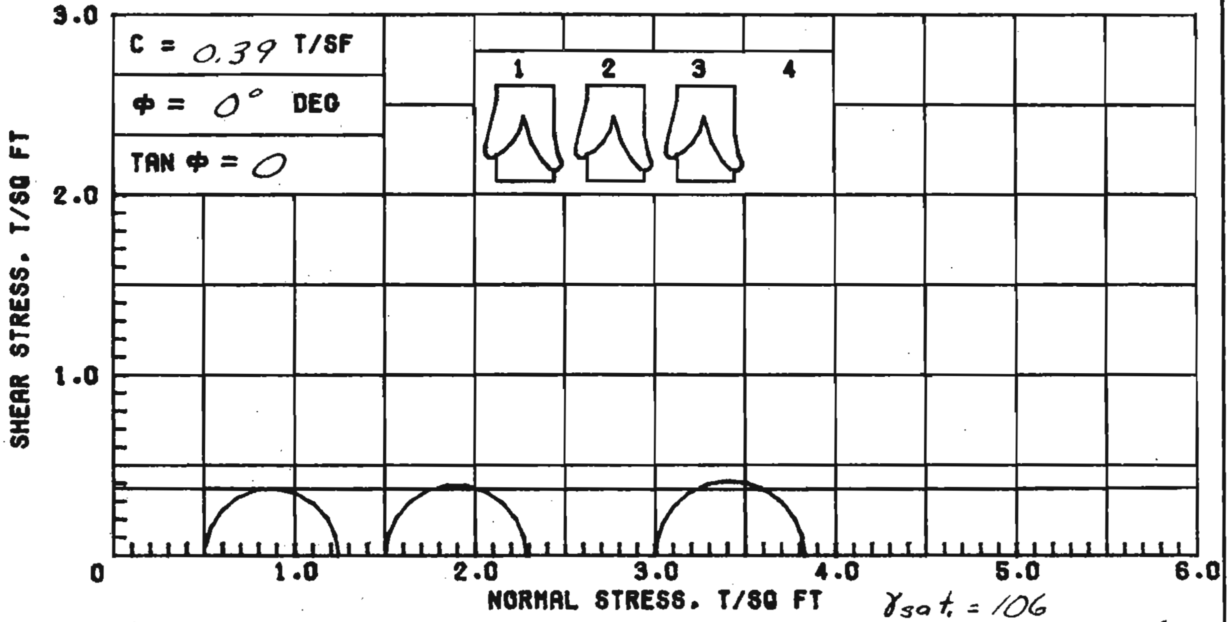
	SPECIMEN NO.	Δ1	Y2	X3	Avg. 4
INITIAL	WATER CONTENT, %	67.2	66.1	66.1	66.5
	DRY DENSITY, PCF	60.4	61.0	60.8	
	SATURATION, %	100+	100+	100+	
	VOID RATIO	1.789	1.763	1.771	
BEFORE SHEAR	WATER CONTENT, %				
	DRY DENSITY, PCF				
	SATURATION, %				
	VOID RATIO				
	BACK PRESS., TSF				
MIN PRIN. STRESS, TSF		0.5	1.5	3.0	
MAX. DEV. STRESS, TSF		0.55	0.57	0.60	
TIME TO FAILURE, MIN.		8	21	25	
RATE OF STRAIN INCR,%			7	7	
INITIAL DIAMETER, IN.		1.39	1.39	1.39	
INITIAL HEIGHT, IN.		3.00	3.00	3.00	

CONTROLLED-STRAIN TEST

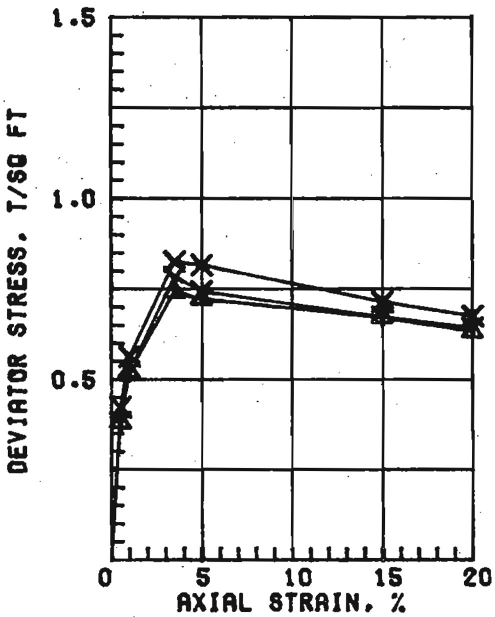
DESCRIPTION OF SPECIMENS: PLASTIC CLAY (CH), GRAY; SILT LENSES

LL 82	PL 23	PI 59	GS 2.70 (ESTIMATED)	UNDISTURBED SPECIMEN	Q TEST

REMARKS:	PROJECT LK. PONT. LA. & VIC. HURR. PROT.	
	ORLEANS PARISH OUTFALL CANALS	
	BORING NO. 3-OUG	SAMPLE NO. 8-C
	DEPTH/ELEV 29.0/-24.6	TECH. PJR
	LABORATORY USAE WES	DATE 21 SEP 84
	TRIAXIAL COMPRESSION TEST REPORT	



$\gamma_{sat} = 106$



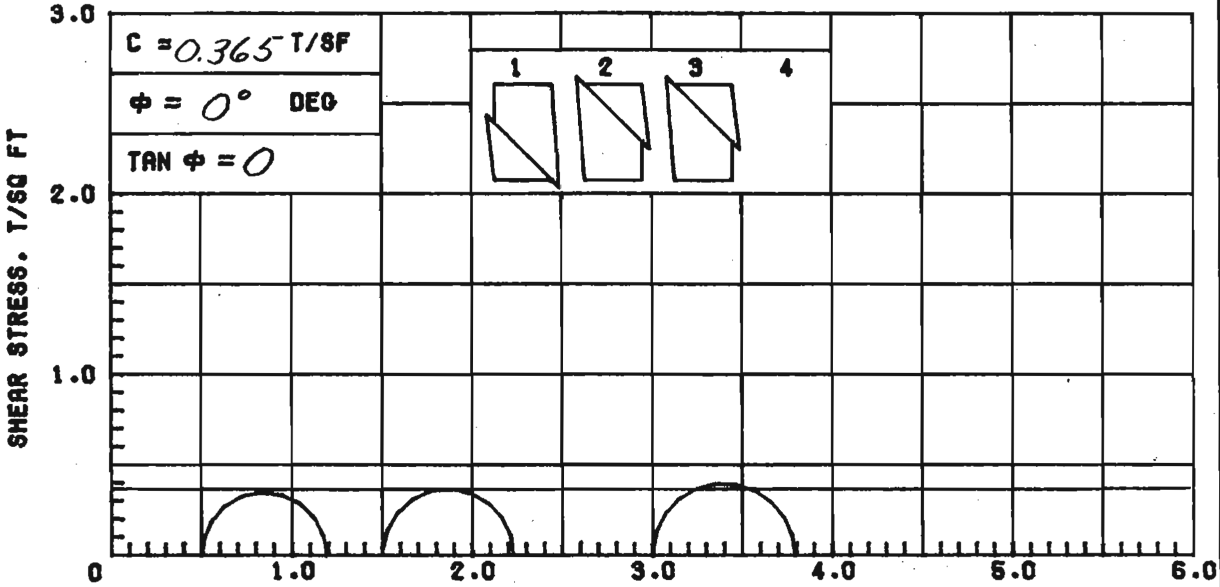
	SPECIMEN NO.	Δ1	Y2	X3	Avg. 4
INITIAL	WATER CONTENT, %	50.7	53.0	52.2	52.0
	DRY DENSITY, PCF	69.7	68.5	68.8	
	SATURATION, %	96.5	97.9	97.2	
	VOID RATIO	1.418	1.461	1.450	
BEFORE SHEAR	WATER CONTENT, %				
	DRY DENSITY, PCF				
	SATURATION, %				
	VOID RATIO				
	BACK PRESS., TSF				
	MIN PRIN. STRESS, TSF	0.5	1.5	3.0	
	MAX. DEV. STRESS, TSF	0.74	0.78	0.83	
	TIME TO FAILURE, MIN.	8	21	21	
	RATE OF STRAIN INCR.,%		5	5	
	INITIAL DIAMETER, IN.	1.40	1.40	1.39	
	INITIAL HEIGHT, IN.	3.00	3.00	3.00	

CONTROLLED-STRAIN TEST

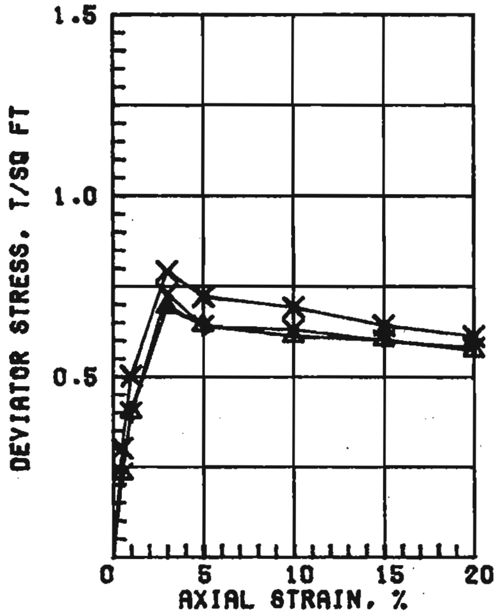
DESCRIPTION OF SPECIMENS; PLASTIC CLAY (CH), GRAY; FINE SAND LENSES

LL	PL	PI	GS 2.70 (ESTIMATED)	UNDISTURBED SPECIMEN	Q TEST

REMARKS;	PROJECT LK. PONT. LA. & VIC. HURR. PROT. ORLEANS PARISH OUTFALL CANALS	
	BORING NO. 3-OUG	SAMPLE NO. 13-C
	DEPTH/ELEV 49.0/-44.6	TECH. PJR
	LABORATORY USAE WES	DATE 21 SEP 84
	TRIAXIAL COMPRESSION TEST REPORT	



$\gamma_{sat.} = 104$



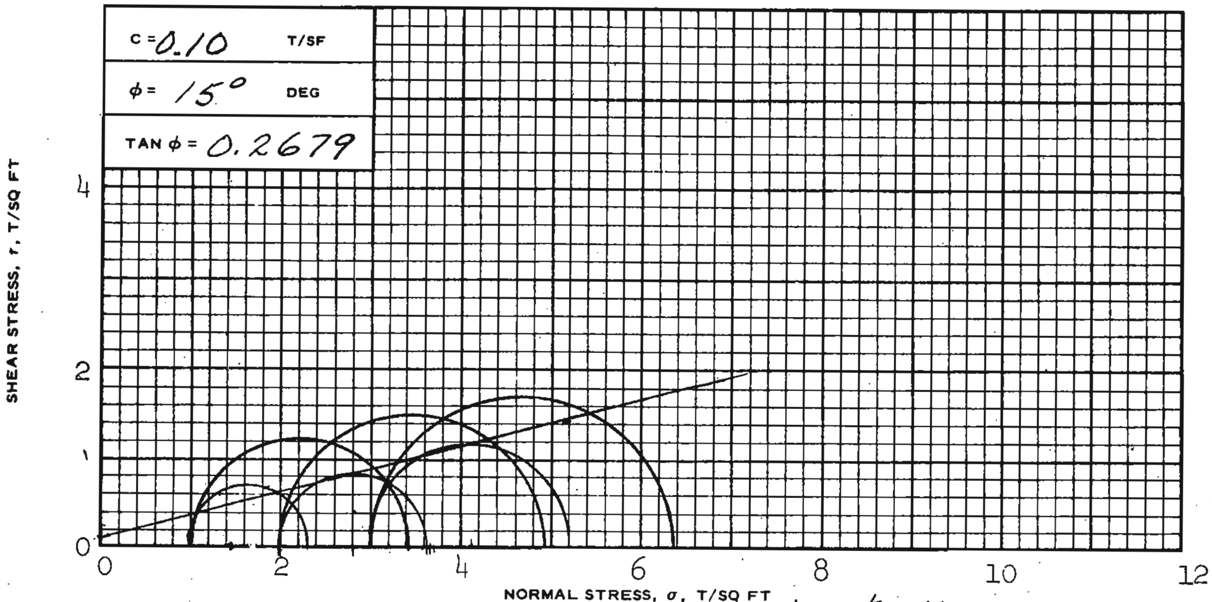
	SPECIMEN NO.	▲1	Y2	X3	Avg. 4
INITIAL	WATER CONTENT, %	54.6	53.4	57.7	55.2
	DRY DENSITY, PCF	66.4	68.2	65.1	
	SATURATION, %	95.7	98.0	98.0	
	VOID RATIO	1.540	1.471	1.589	
BEFORE SHEAR	WATER CONTENT, %				
	DRY DENSITY, PCF				
	SATURATION, %				
	VOID RATIO				
	BACK PRESS., TSF				
	MIN PRIN. STRESS, TSF	0.5	1.5	3.0	
	MAX. DEV. STRESS, TSF	0.69	0.73	0.79	
	TIME TO FAILURE, MIN.	6	6	6	
	RATE OF STRAIN INCR.,%				
	INITIAL DIAMETER, IN.	1.40	1.40	1.40	
	INITIAL HEIGHT, IN.	3.00	3.00	3.00	

CONTROLLED-STRAIN TEST

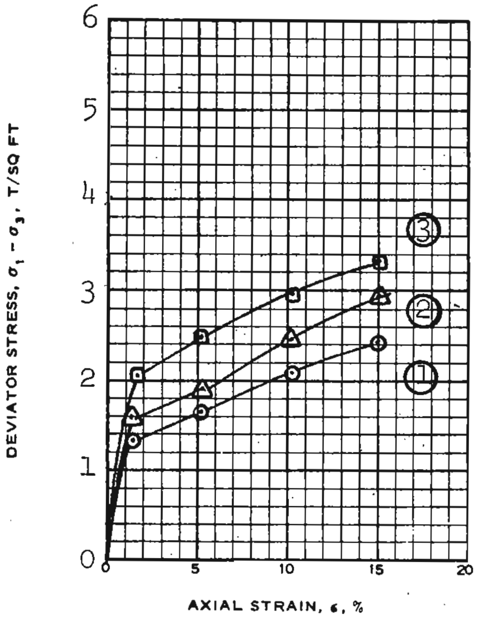
DESCRIPTION OF SPECIMENS: PLASTIC CLAY (CH), GRAY; SHELL PARTICLES

LL	PL	PI	GS 2.70 (ESTIMATED)	UNDISTURBED SPECIMEN	Q TEST

REMARKS:	PROJECT LK. PONT. LA. & VIC. HURR. PROT.	
	ORLEANS PARISH OUTFALL CANALS	
	BORING NO. 3-OUG	SAMPLE NO. 14-C
	DEPTH/ELEV 53.0/-48.6	TECH. KOC
	LABORATORY USAE WES	DATE 21 SEP 84
	TRIAXIAL COMPRESSION TEST REPORT	



$\gamma sat. = 116$



SPECIMEN NO.			1	2	3	Avg.
INITIAL	WATER CONTENT, %	w_o	36.0	37.0	37.5	36.8
INITIAL	DRY DENSITY LB/CU FT	γ_{d_o}	85.6	84.1	83.8	
INITIAL	SATURATION, %	S_o	100+	100+	100+	
INITIAL	VOID RATIO	e_o	0.947	0.982	0.990	
BEFORE SHEAR	WATER CONTENT, %	w_c	34.7	33.9	33.3	
BEFORE SHEAR	DRY DENSITY LB/CU FT	γ_{d_c}	89.0	88.1	89.7	
BEFORE SHEAR	SATURATION, %	S_c	100+	100+	100+	
BEFORE SHEAR	VOID RATIO	e_c	0.874	0.893	0.858	
BEFORE SHEAR	FINAL BACK PRESSURE, T/SQ FT	u_o	4.32	4.32	4.32	
MINOR PRINCIPAL STRESS, T/SQ FT		σ_3	1.0	2.0	3.0	
MAXIMUM DEVIATOR STRESS, T/SQ FT		$(\sigma_1 - \sigma_3)_{MAX}$	2.45	2.94	3.36	
TIME TO $(\sigma_1 - \sigma_3)_{MAX}$, MIN		t_f	1000	1000	1000	
ULTIMATE DEVIATOR STRESS, T/SQ FT		$(\sigma_1 - \sigma_3)_{ULT}$	1.30	1.60	2.30	
INITIAL DIAMETER, IN.		D_o	1.36	1.36	1.36	
INITIAL HEIGHT, IN.		H_o	3.00	3.00	3.00	

CONTROLLED- STRAIN TEST

DESCRIPTION OF SPECIMENS SILT (ML), GRAY

LL	PL	PI	Gs 2.67 (EST)	TYPE OF SPECIMEN UNDISTURBED	TYPE OF TEST R

REMARKS:

PROJECT LK. PONT. LA. & VIC. HURR. PROT. ORLEANS PARISH OUTFALL CANALS

BORING NO. 3-OUG SAMPLE NO. 5-B

DEPTH/ELEV 16.3/-11.9

LABORATORY USAEWES DATE 06 SEP 1984

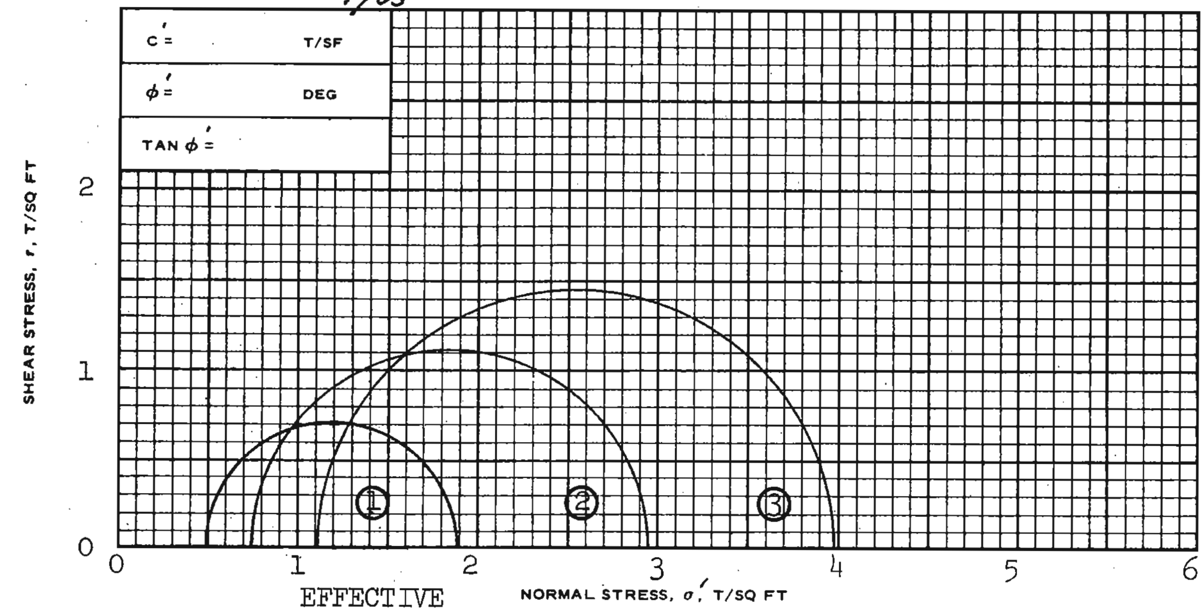
SHEET 1 OF 2

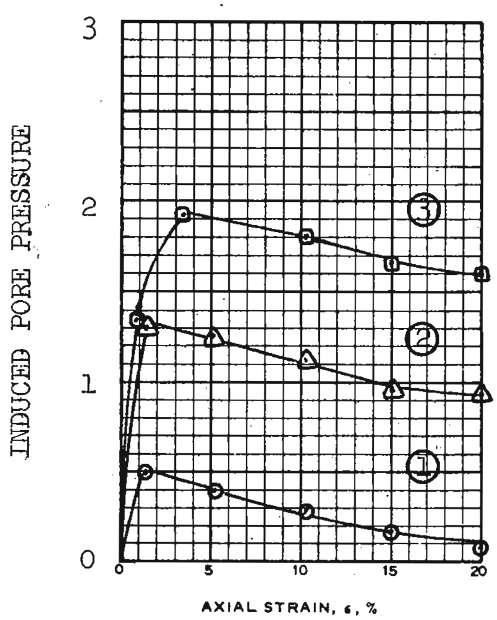
JMS **TRIAXIAL COMPRESSION TEST REPORT**

ENG FORM NO. 2089 REV JUNE 1970 PREVIOUS EDITION IS OBSOLETE

BASED ON MAX σ_1'/σ_3'

c' =		T/SF
ϕ' =		DEG
TAN ϕ' =		





SPECIMEN NO.			1	2	3	
INITIAL	WATER CONTENT, %	w_o				
	DRY DENSITY LB/CU FT	γd_o				
	SATURATION, %	S_o				
	VOID RATIO	e_o				
BEFORE SHEAR	WATER CONTENT, %	w_c				
	DRY DENSITY LB/CU FT	γd_c				
	SATURATION, %	S_c				
	VOID RATIO	e_c				
	FINAL BACK PRESSURE, T/SQ FT	u_o				
MINOR PRINCIPAL STRESS, T/SQ FT		σ_3	0.50	0.74	1.11	
MAXIMUM DEVIATOR STRESS, T/SQ FT		$(\sigma_1 - \sigma_3)_{MAX}$	1.40	2.22	2.85	
TIME TO $(\sigma_1 - \sigma_3)_{MAX}$, MIN		t_f				
ULTIMATE DEVIATOR STRESS, T/SQ FT		$(\sigma_1 - \sigma_3)_{ULT}$				
INITIAL DIAMETER, IN.		D_o				
INITIAL HEIGHT, IN.		H_o				

CONTROLLED- TEST

DESCRIPTION OF SPECIMENS

LL	PL	PI	Gs	TYPE OF SPECIMEN	TYPE OF TEST

REMARKS:

PROJECT LK. PONT. LA. & VIC. HURR. PROT.
ORLEANS PARISH OUTFALL CANALS

BORING NO. 3-OUG SAMPLE NO. 5-B

DEPTH/ELEV 16.3/-11.9

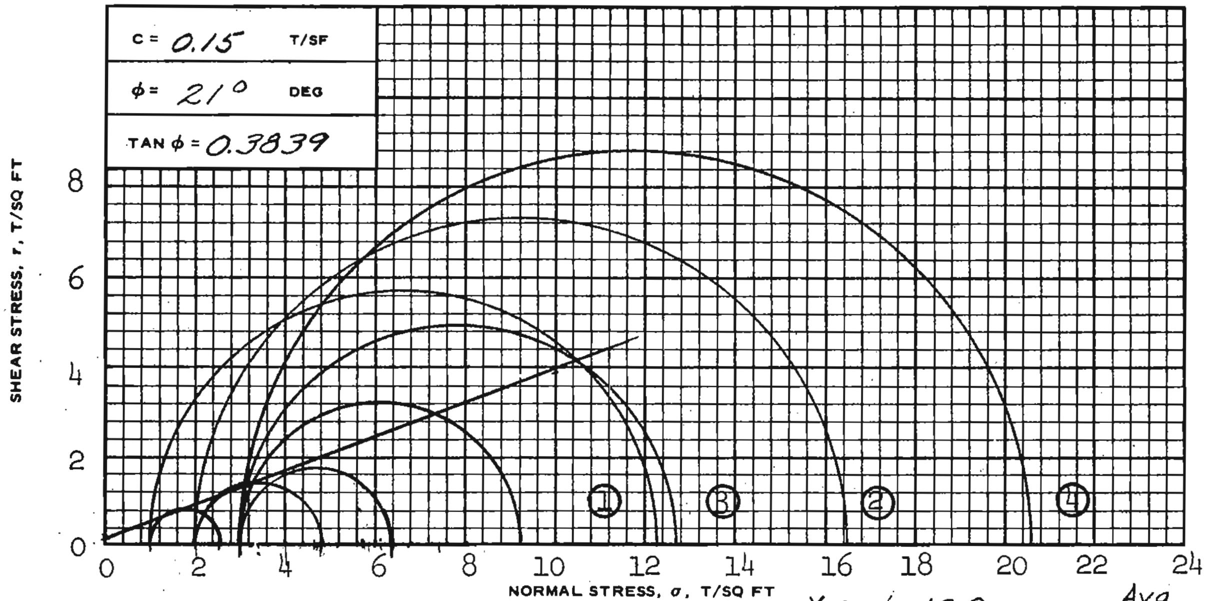
LABORATORY USAEWES DATE 06 SEP 1984

SHEET 2 OF 2

JMS **TRIAXIAL COMPRESSION TEST REPORT**

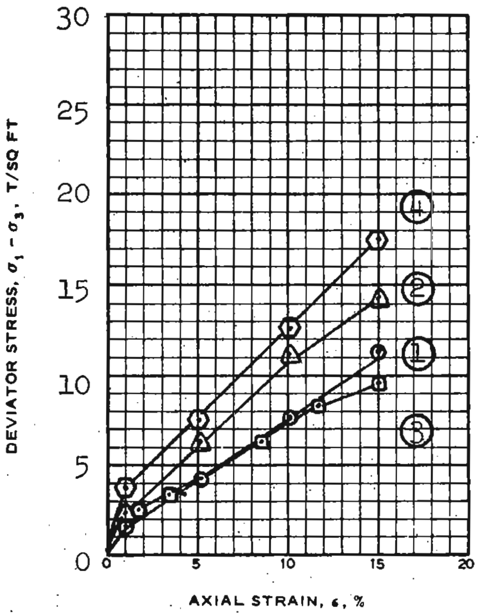
ENG FORM NO. 2089 REV JUNE 1970 PREVIOUS EDITION IS OBSOLETE

c = 0.15	T/SF	
φ = 21°	DEG	
TAN φ = 0.3839		



γSat.=120

Avg. 31.4



				1	2	3	4
SPECIMEN NO.				1	2	3	4
INITIAL	WATER CONTENT, %		w_o	31.5	31.2	32.1	30.8
INITIAL	DRY DENSITY LB/CU FT		γ_{d_o}	91.3	91.9	88.7	92.3
INITIAL	SATURATION, %		S_o	100+	100+	97.5	100+
INITIAL	VOID RATIO		e_o	0.826	0.813	0.879	0.805
BEFORE SHEAR	WATER CONTENT, %		w_c	32.3	31.6	31.2	30.4
BEFORE SHEAR	DRY DENSITY LB/CU FT		γ_{d_c}	93.9	95.1	92.4	95.4
BEFORE SHEAR	SATURATION, %		S_c	100+	100+	100+	100+
BEFORE SHEAR	VOID RATIO		e_c	0.774	0.753	0.805	0.748
BEFORE SHEAR	FINAL BACK PRESSURE, T/SQ FT		u_o	4.32	4.32	4.32	4.32
MINOR PRINCIPAL STRESS, T/SQ FT			σ_3	1.0	2.0	3.0	3.0
MAXIMUM DEVIATOR STRESS, T/SQ FT			$(\sigma_1 - \sigma_3)_{MAX}$	11.30	14.42	9.72	17.65
TIME TO $(\sigma_1 - \sigma_3)_{MAX}$, MIN			t_f	1000	1000	1000	1000
ULTIMATE DEVIATOR STRESS, T/SQ FT			$(\sigma_1 - \sigma_3)_{ULT}$	1.50	2.70	3.40	6.20
INITIAL DIAMETER, IN.			D_o	1.36	1.36	1.38	1.36
INITIAL HEIGHT, IN.			H_o	3.00	3.00	3.00	3.00

CONTROLLED- STRAIN TEST

DESCRIPTION OF SPECIMENS SILT (ML), GRAY

LL	PL	PI	Gs 2.67 (EST)	TYPE OF SPECIMEN UNDISTURBED	TYPE OF TEST $\bar{R}$

REMARKS:

PROJECT LK. PONT. LA. & VIC. HURR. PROT.
ORLEANS PARISH OUTFALL CANALS

BORING NO. 3-OUG | SAMPLE NO. 6-C

DEPTH/ELEV 21.0/-16.6

LABORATORY USAEWES | DATE 20 SEP 1984

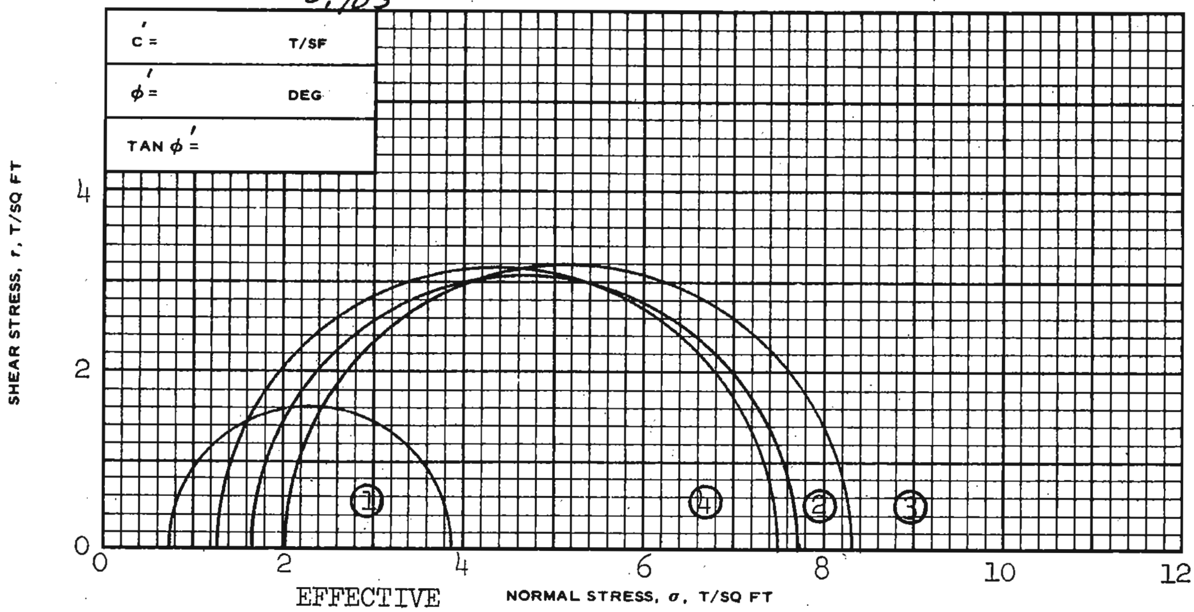
SHEET 1 OF 2

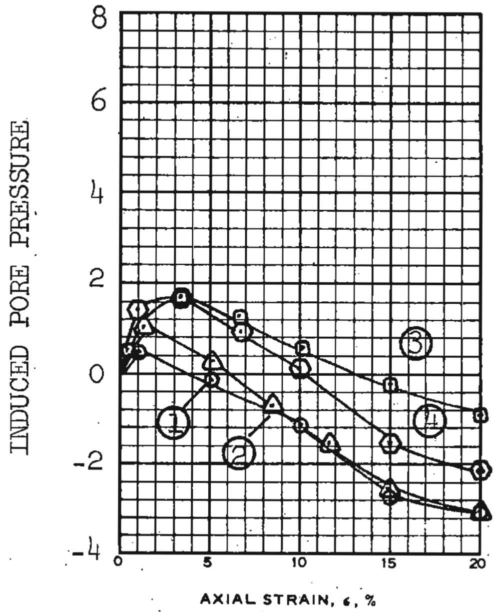
JMS **TRIAXIAL COMPRESSION TEST REPORT**

ENG FORM NO. 2089
REV JUNE 1970 PREVIOUS EDITION IS OBSOLETE

BASED ON MAX σ_1'/σ_3'

C' =	T/SF
ϕ' =	DEG
TAN ϕ' =	





				1	2	3	4
SPECIMEN NO.				1	2	3	4
INITIAL	WATER CONTENT, %		w_o				
	DRY DENSITY LB/ CU FT		γd_o				
	SATURATION, %		S_o				
	VOID RATIO		e_o				
BEFORE SHEAR	WATER CONTENT, %		w_c				
	DRY DENSITY LB/CU FT		γd_c				
	SATURATION, %		S_c				
	VOID RATIO		e_c				
	FINAL BACK PRESSURE, T/SQ FT		u_o				
MINOR PRINCIPAL STRESS, T/SQ FT			σ_3	0.75	1.64	2.01	1.27
MAXIMUM DEVIATOR STRESS, T/SQ FT			$(\sigma_1 - \sigma_3)_{MAX}$	3.14	6.08	6.31	6.22
TIME TO $(\sigma_1 - \sigma_3)_{MAX}$, MIN			t_f				
ULTIMATE DEVIATOR STRESS, T/SQ FT			$(\sigma_1 - \sigma_3)_{ULT}$				
INITIAL DIAMETER, IN.			D_o				
INITIAL HEIGHT, IN.			H_o				

CONTROLLED- TEST

DESCRIPTION OF SPECIMENS

LL	PL	PI	Gs	TYPE OF SPECIMEN	TYPE OF TEST

REMARKS:

PROJECT LK. PONT. LA. & VIC. HURR. PROT.
ORLEANS PARISH OUTFALL CANALS

BORING NO. 3-OUG SAMPLE NO. 6-C

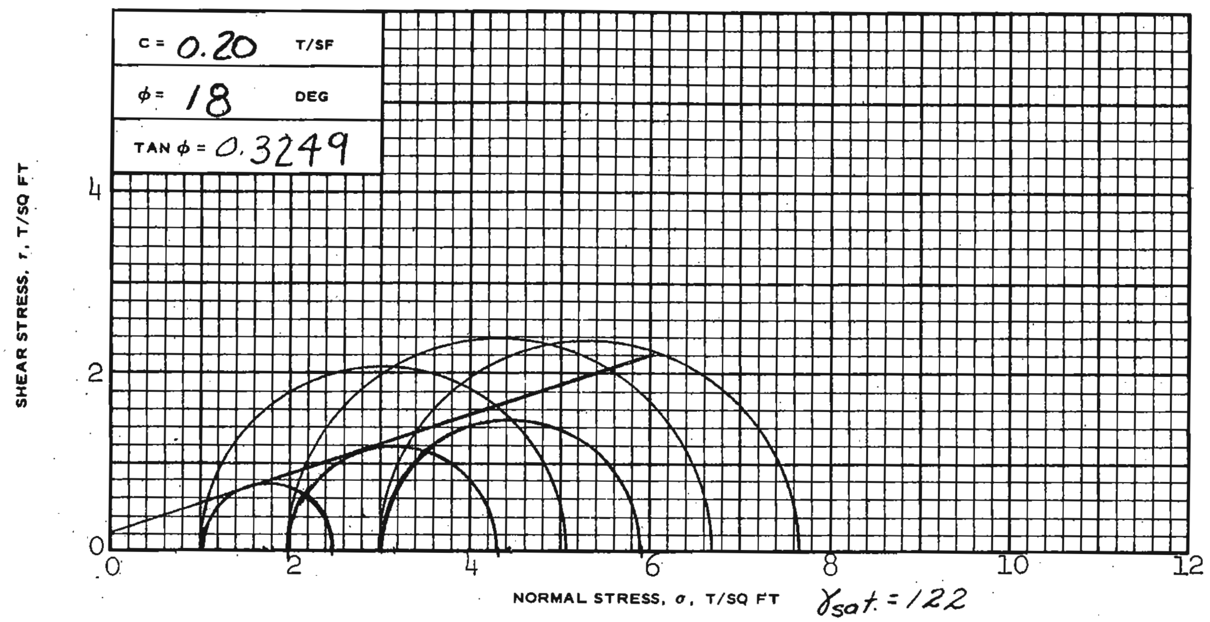
DEPTH/ELEV 21.0/-16.6

LABORATORY USAEWES DATE 20 SEP 1984

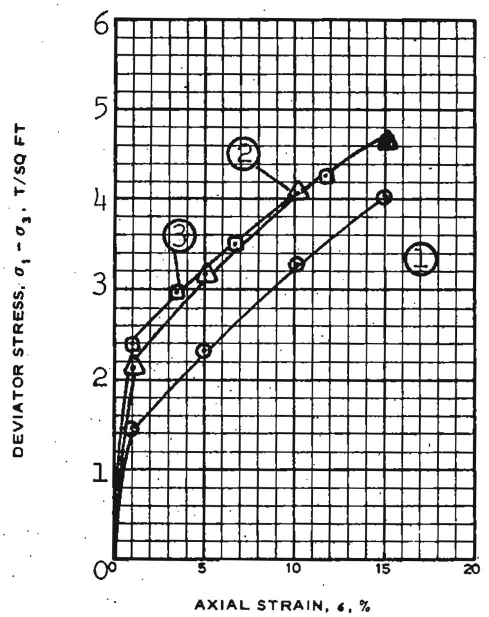
SHEET 2 OF 2

JMS **TRIAXIAL COMPRESSION TEST REPORT**

ENG FORM NO. 2089 PREVIOUS EDITION IS OBSOLETE
REV JUNE 1970



$\gamma_{sat} = 122$



SPECIMEN NO.			1	2	3	Avg.
INITIAL	WATER CONTENT, %	w_o	26.1	27.4	26.7	26.7
	DRY DENSITY LB/CU FT	γ_{d_o}	96.4	94.9	95.7	
	SATURATION, %	S_o	95.7	96.7	96.2	
	VOID RATIO	e_o	0.729	0.757	0.741	
BEFORE SHEAR	WATER CONTENT, %	w_c	27.3	28.3	26.9	
	DRY DENSITY LB/CU FT	γ_{d_c}	98.2	97.7	99.2	
	SATURATION, %	S_c	100+	100+	100+	
	VOID RATIO	e_c	0.698	0.706	0.681	
	FINAL BACK PRESSURE, T/SQ FT	u_o	5.76	5.76	5.76	
MINOR PRINCIPAL STRESS, T/SQ FT		σ_3	1.0	2.0	3.0	
MAXIMUM DEVIATOR STRESS, T/SQ FT		$(\sigma_1 - \sigma_3)_{MAX}$	4.02	4.65	4.64	
TIME TO $(\sigma_1 - \sigma_3)_{MAX}$, MIN		t_f	1071	1071	1071	
ULTIMATE DEVIATOR STRESS, T/SQ FT		$(\sigma_1 - \sigma_3)_{ULT}$	1.45	2.32	2.95	
INITIAL DIAMETER, IN.		D_o	1.36	1.37	1.38	
INITIAL HEIGHT, IN.		H_o	3.00	3.00	3.00	

CONTROLLED- STRAIN TEST

DESCRIPTION OF SPECIMENS SANDY SILT (ML), LIGHT GRAY

LL	PL	PI	Gs 2.67 (EST)	TYPE OF SPECIMEN UNDISTURBED	TYPE OF TEST $\overline{R}$

REMARKS:

PROJECT LK. PONT. LA. & VIC. HURR. PROT.
ORLEANS PARISH OUTFALL CANALS

BORING NO. 3-OUG SAMPLE NO. 17 -B

DEPTH/ELEV 64.2/-59.8

LABORATORY USAEWES DATE 18 SEPT 1984

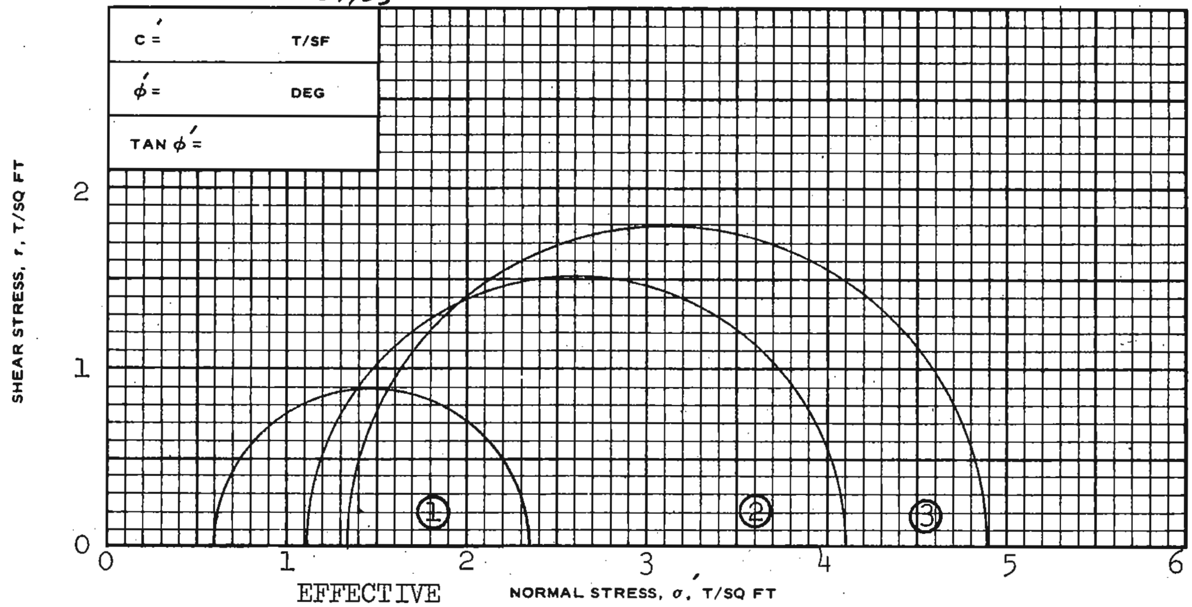
SHEET 1 OF 2

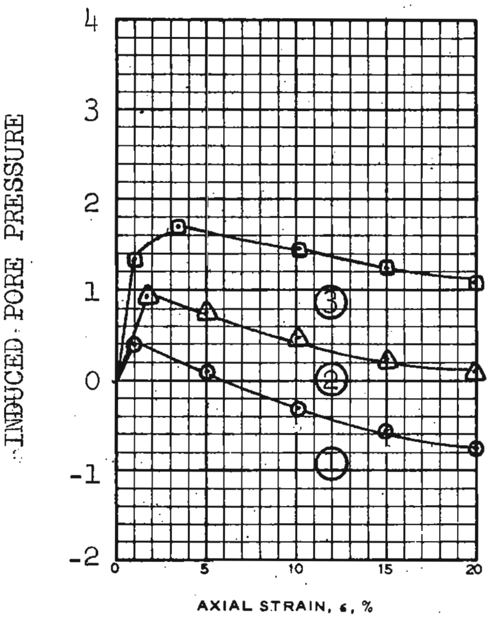
JMS **TRIAXIAL COMPRESSION TEST REPORT**

ENG FORM NO. 2089 REV JUNE 1970 PREVIOUS EDITION IS OBSOLETE

BASED ON MAX σ_1'/σ_3'

c' =	T/SF
ϕ' =	DEG
TAN ϕ' =	





SPECIMEN NO.			1	2	3	
INITIAL	WATER CONTENT, %	w_0				
	DRY DENSITY LB/CU FT	γd_0				
	SATURATION, %	S_0				
	VOID RATIO	e_0				
BEFORE SHEAR	WATER CONTENT, %	w_c				
	DRY DENSITY LB/CU FT	γd_c				
	SATURATION, %	S_c				
	VOID RATIO	e_c				
	FINAL BACK PRESSURE, T/SQ FT	u_0				
MINOR PRINCIPAL STRESS, T/SQ FT		σ_3	0.60	1.12	1.35	
MAXIMUM DEVIATOR STRESS, T/SQ FT		$(\sigma_1 - \sigma_3)_{MAX}$	1.75	2.98	3.52	
TIME TO $(\sigma_1 - \sigma_3)_{MAX}$, MIN		t_f				
ULTIMATE DEVIATOR STRESS, T/SQ FT		$(\sigma_1 - \sigma_3)_{ULT}$				
INITIAL DIAMETER, IN.		D_0				
INITIAL HEIGHT, IN.		H_0				

CONTROLLED- TEST

DESCRIPTION OF SPECIMENS

LL	PL	PI	Gs	TYPE OF SPECIMEN	TYPE OF TEST

REMARKS:

PROJECT LK. PONT. LA.& VIC. HURR. PROT.
ORLEANS PARISH OUTFALL CANALS

BORING NO. 3-OUG SAMPLE NO. 17-B

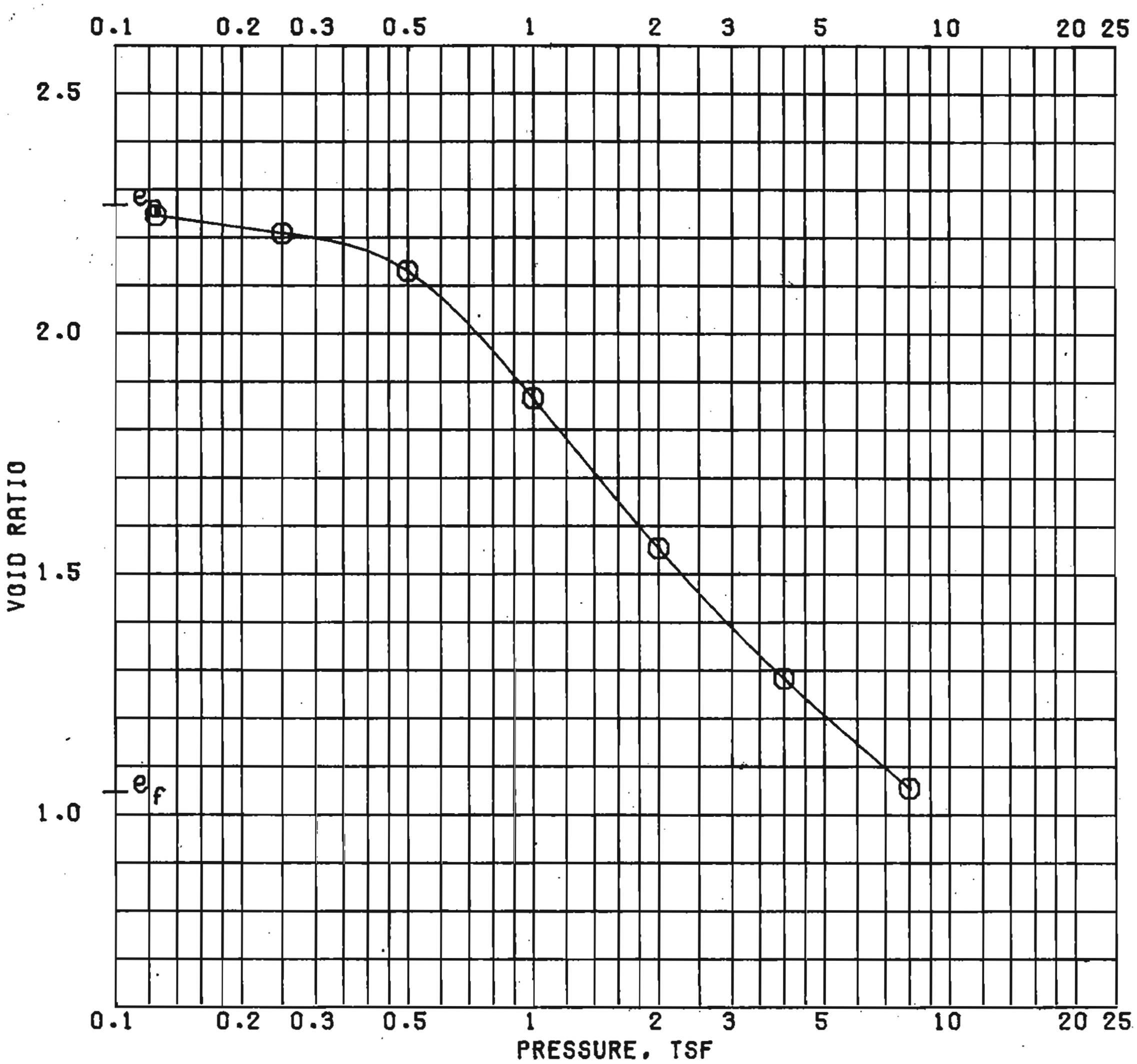
DEPTH/ELEV 64.2/-59.8

LABORATORY USAEWES DATE 18 SEPT 1984

SHEET 2 OF 2

JMS **TRIAXIAL COMPRESSION TEST REPORT**

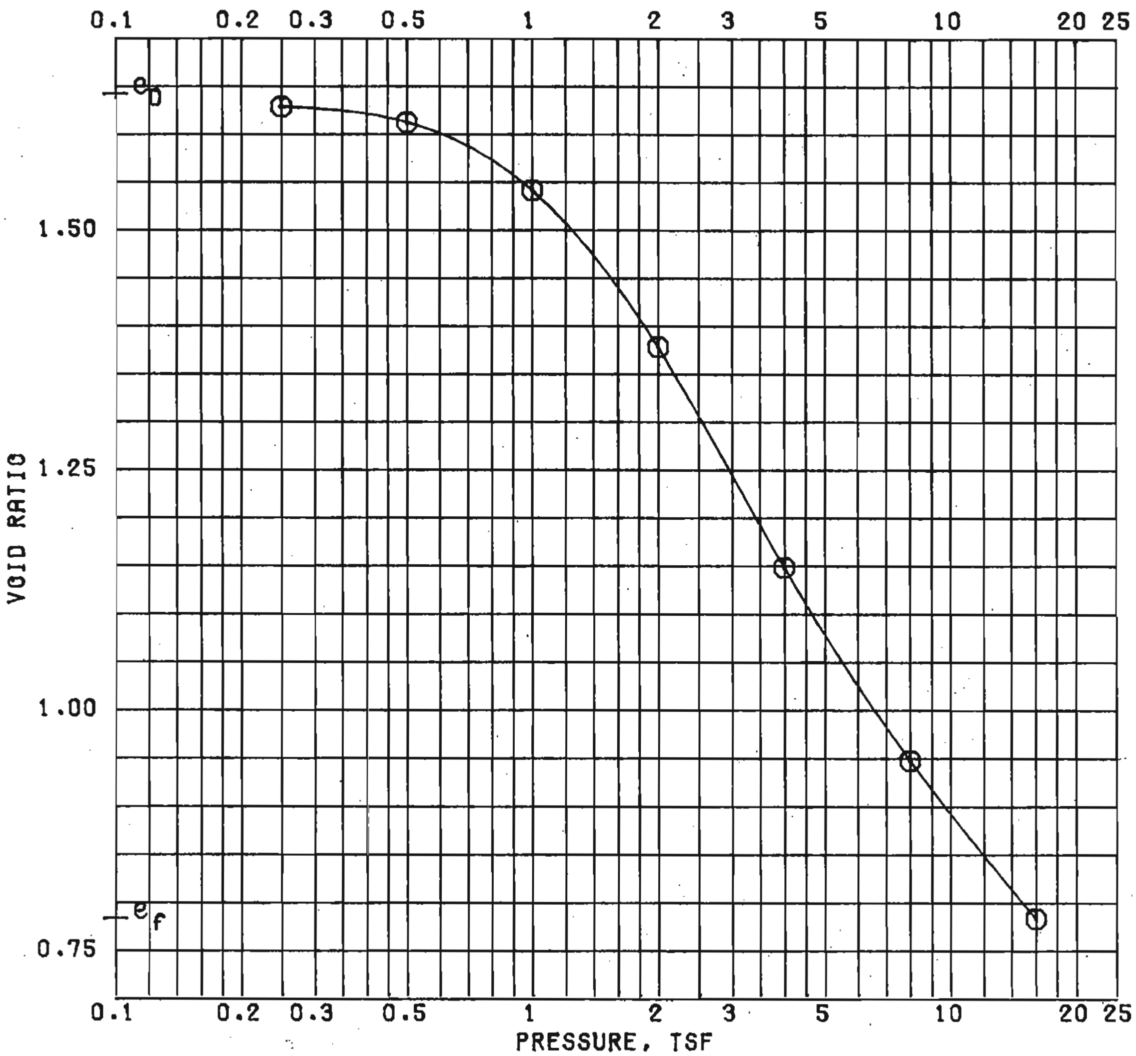
ENG FORM NO. 2089 REV JUNE 1970 PREVIOUS EDITION IS OBSOLETE



$\gamma_{sat.} = 95$

			BEFORE TEST	AFTER TEST
OVERBURDEN PRESSURE, TSF		WATER CONTENT, %	81.4	28.5
PRECONSOL. PRESSURE, TSF	0.40	DRY DENSITY, PCF	51.6	82.5
COMPRESSION INDEX		SATURATION, %	97.1	73.8
TYPE SPECIMEN	UNDISTURBED	VOID RATIO	2.264	1.042
DIA. IN 4.44	HT. IN 1.116	BACK PRESSURE, TSF		
CLASSIFICATION PLASTIC CLAY (CH), GRAY				
LL / PL / PI		PROJECT LK. PONT. LA. & VIC. HURR. PROT.		
GS 2.70 (EST)	D_{10}	ORLEANS PARISH OUTFALL CANALS		
REMARKS		BORING NO. 3-OUG	SAMPLE NO. 3-B	
		DEPTH/ELEV 8.4/-4.0	DATE 02 OCT 84	
		CONSOLIDATION TEST REPORT		

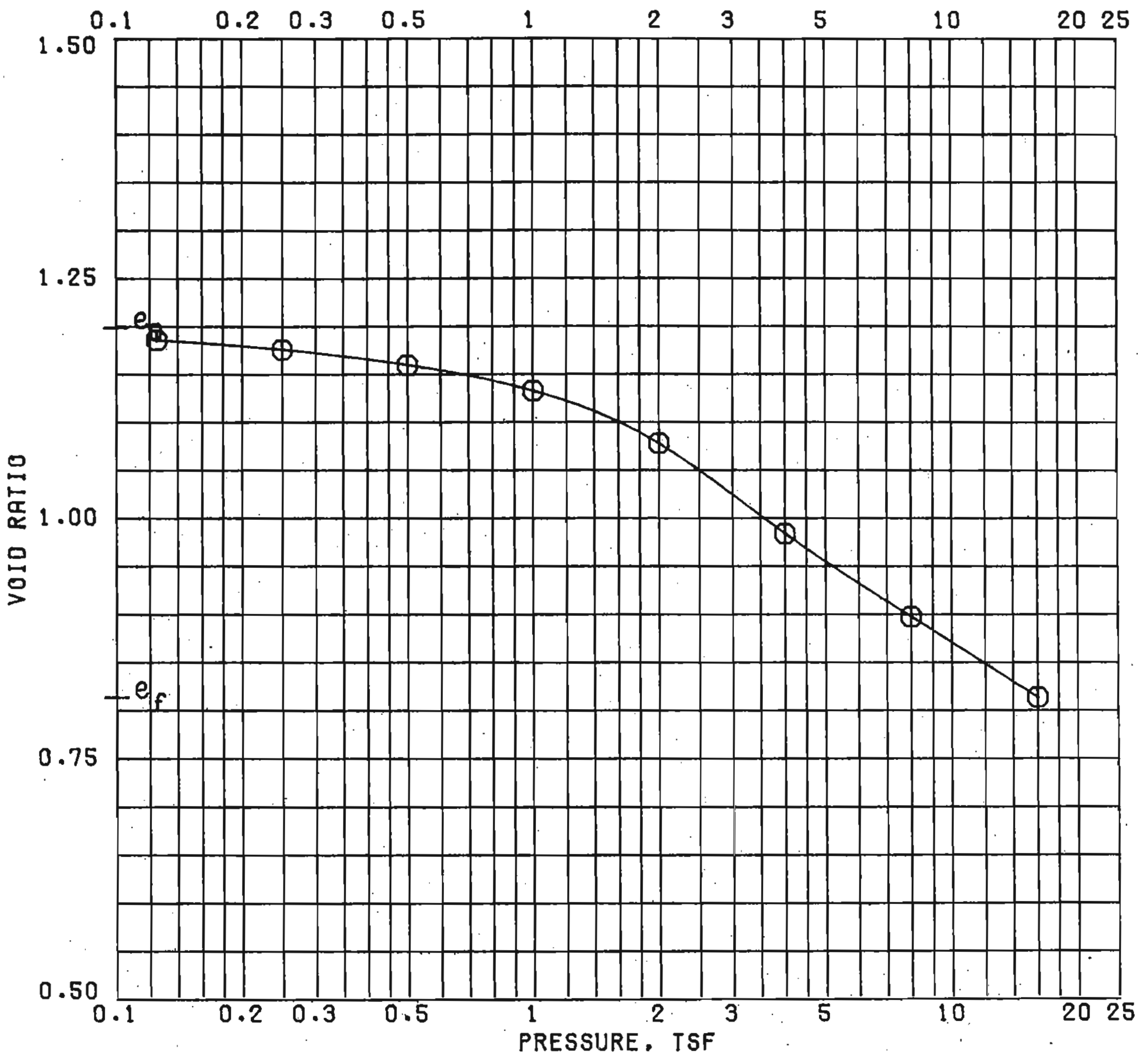
SHEET 1 OF 9



$\gamma_{sat.} = 103$

			BEFORE TEST	AFTER TEST
OVERBURDEN PRESSURE, TSF		WATER CONTENT, %	57.7	31.4
PRECONSOL. PRESSURE, TSF	0.85	DRY DENSITY, PCF	63.8	94.6
COMPRESSION INDEX		SATURATION, %	95.0	100 +
TYPE SPECIMEN	UNDISTURBED	VOID RATIO	1.641	0.782
DIA. IN 4.44	HT. IN 1.118	BACK PRESSURE, TSF		
CLASSIFICATION PLASTIC CLAY (CH), GRAY; SILT LENSES				
LL	PL / PI	PROJECT LK. PONT. LA. & VIC. HURR. PROT.		
GS 2.70 (EST)	D_{10}	ORLEANS PARISH OUTFALL CANALS		
REMARKS		BORING NO. 3-OUG	SAMPLE NO. 8-B	
		DEPTH/ELEV 28.2/-23.8	DATE 03 OCT 84	
		CONSOLIDATION TEST REPORT		

SHEET 1 OF 9

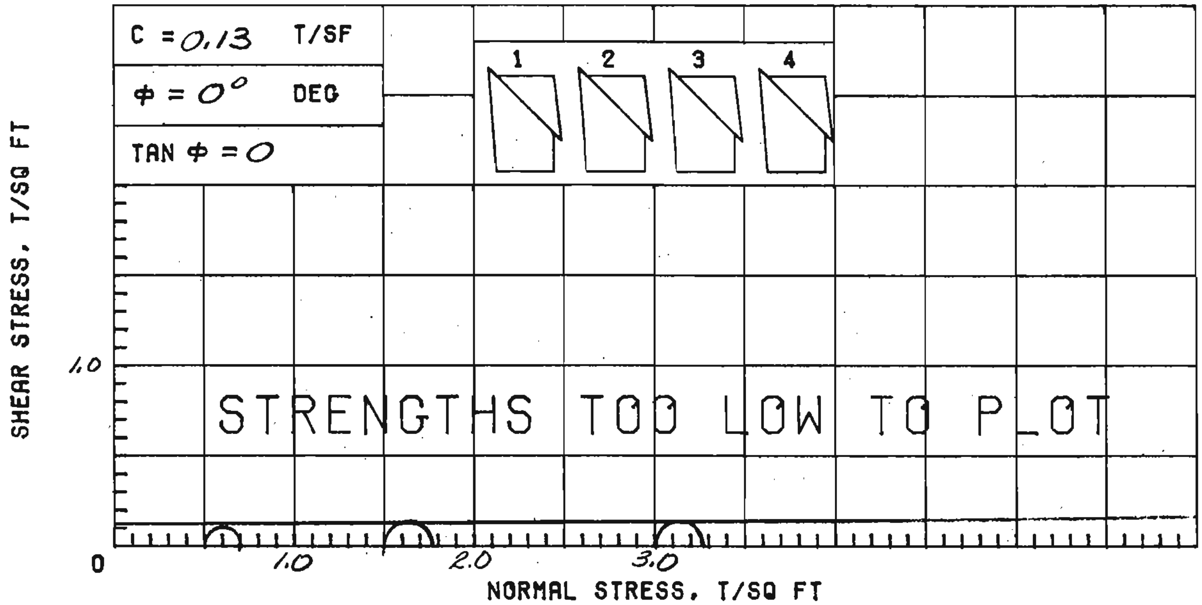


$\gamma_{sat.} = 111$

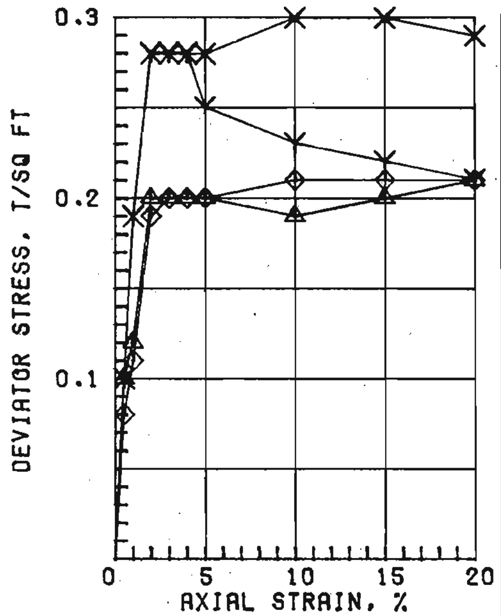
			BEFORE TEST	AFTER TEST
OVERBURDEN PRESSURE, TSF		WATER CONTENT, %	39.7	28.6
PRECONSOL. PRESSURE, TSF	1.40	DRY DENSITY, PCF	76.7	93.0
COMPRESSION INDEX		SATURATION, %	89.7	95.2
TYPE SPECIMEN	UNDISTURBED	VOID RATIO	1.197	0.812
DIA. IN 4.44	HT. IN 1.142	BACK PRESSURE, TSF		

CLASSIFICATION SANDY CLAY (CL), GRAY; FINE SAND LENSES			
LL	PL	PI	PROJECT LK. PONT. LA. & VIC. HURR. PROT.
GS 2.70 (EST)	D_{10}		ORLEANS PARISH OUTFALL CANALS
REMARKS		BORING NO. 3-OUG	SAMPLE NO. 13-B
		DEPTH/ELEV 48.2/-43.8	DATE 04 OCT 84
		CONSOLIDATION TEST REPORT	

SHEET 1 OF 10



γsat. = 108



	SPECIMEN NO.	△1	Y2	X3	◇4	
INITIAL	WATER CONTENT, %	48.5	50.5	45.5	47.2	Avg. 47.9
	DRY DENSITY, PCF	72.4	71.0	74.1	73.3	
	SATURATION, %	98.7	99.3	96.4	98.0	
	VOID RATIO	1.327	1.374	1.274	1.301	
BEFORE SHEAR	WATER CONTENT, %					
	DRY DENSITY, PCF					
	SATURATION, %					
	VOID RATIO					
	BACK PRESS., TSF					
	MIN PRIN. STRESS, TSF	0.5	1.5	3.0	0.5	
	MAX. DEV. STRESS, TSF	0.20	0.28	0.28	0.20	
	TIME TO FAILURE, MIN.	4	4	4	6	
	RATE OF STRAIN INCR,%					
	INITIAL DIAMETER, IN.	1.40	1.40	1.40	1.40	
	INITIAL HEIGHT, IN.	3.00	3.00	3.00	3.00	

CONTROLLED-STRAIN TEST

DESCRIPTION OF SPECIMENS: PLASTIC CLAY (CH), GRAY; SHELL PARTICLES

LL 64	PL 20	PI 44	GS 2.70 (ESTIMATED)	UNDISTURBED SPECIMEN	Q TEST

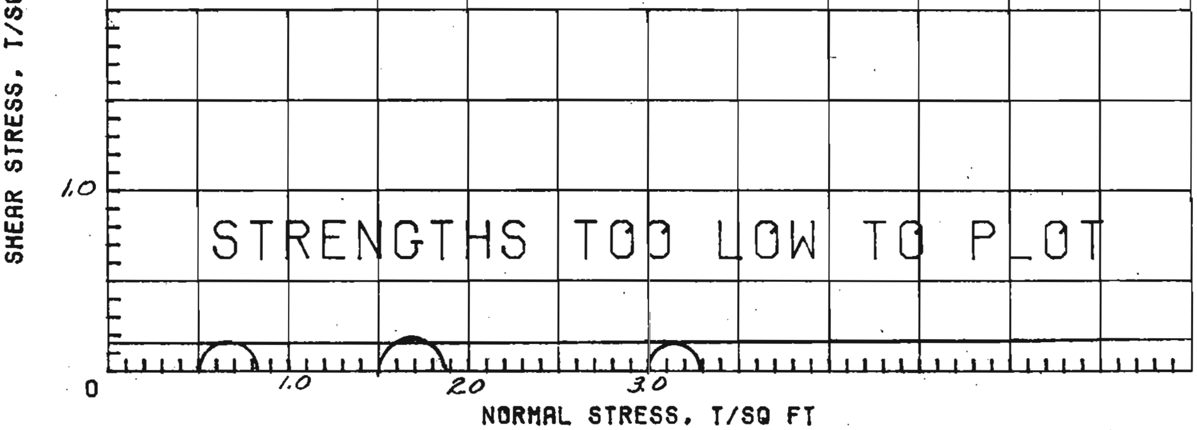
REMARKS:

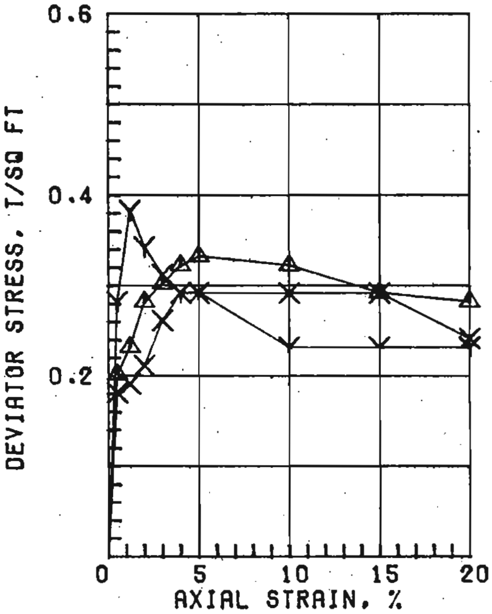
PROJECT LK PONT LA & VIC HURR PROT	
ORLEANS PARISH OUTFALL CANALS	
BORING NO. 4-OUG	SAMPLE NO. 4-B
DEPTH/ELEV 12.0/-17.9	TECH. KOC
LABORATORY USAE WES	DATE 18 DEC 84
TRIAXIAL COMPRESSION TEST REPORT	

C = 0.165 T/SF

φ = 0° DEG

TAN φ = 0





γsat = 97

SPECIMEN NO.		△1	Y2	X3	Avg. 4
INITIAL	WATER CONTENT, %	80.4	79.4	78.3	79.4
	DRY DENSITY, PCF	53.1	54.1	54.8	
	SATURATION, %	99.9	100+	100+	
	VOID RATIO	2.174	2.118	2.077	
BEFORE SHEAR	WATER CONTENT, %				
	DRY DENSITY, PCF				
	SATURATION, %				
	VOID RATIO				
	BACK PRESS., TSF				
MIN PRIN. STRESS, TSF		0.5	1.5	3.0	
MAX. DEV. STRESS, TSF		0.33	0.38	0.29	
TIME TO FAILURE, MIN.		10	2	8	
RATE OF STRAIN INCR,%					
INITIAL DIAMETER, IN.		1.39	1.39	1.40	
INITIAL HEIGHT, IN.		3.00	3.00	3.00	

CONTROLLED-STRAIN TEST

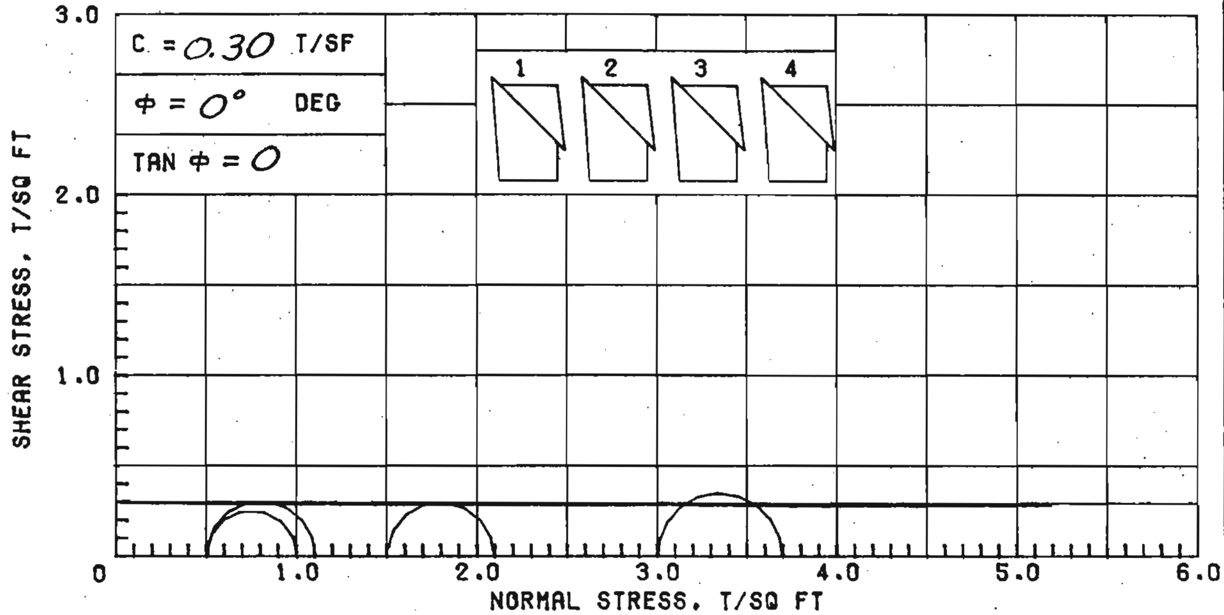
DESCRIPTION OF SPECIMENS: PLASTIC CLAY (CH), GRAY

LL 93	PL 24	PI 69	GS 2.70 (ESTIMATED)	UNDISTURBED SPECIMEN	Q TEST

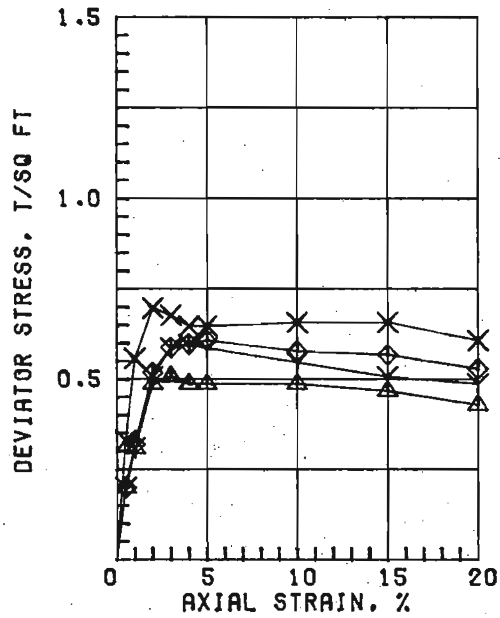
REMARKS:

PROJECT LK PONT LA & VIC HURR PROT ORLEANS PARISH OUTFALL CANALS	
BORING NO. 4-OUG	SAMPLE NO. 6-B
DEPTH/ELEV 20.0/-25.9	TECH. KOC
LABORATORY USAE WES	DATE 19 DEC 84

TRIAXIAL COMPRESSION TEST REPORT



γsat. = 105



	SPECIMEN NO.	△1	Y2	X3	◇4
INITIAL	WATER CONTENT, %	50.7	47.6	59.3	49.3
	DRY DENSITY, PCF	68.6	71.1	63.2	69.1
	SATURATION, %	94.0	93.7	96.1	92.4
	VOID RATIO	1.456	1.371	1.666	1.440
BEFORE SHEAR	WATER CONTENT, %				
	DRY DENSITY, PCF				
	SATURATION, %				
	VOID RATIO				
	BACK PRESS., TSF				
MIN PRIN. STRESS, TSF		0.5	1.5	3.0	0.5
MAX. DEV. STRESS, TSF		0.51	0.59	0.70	0.61
TIME TO FAILURE, MIN.		6	8	4	10
RATE OF STRAIN INCR,%					
INITIAL DIAMETER, IN.		1.41	1.41	1.40	1.40
INITIAL HEIGHT, IN.		3.00	3.00	3.00	3.00

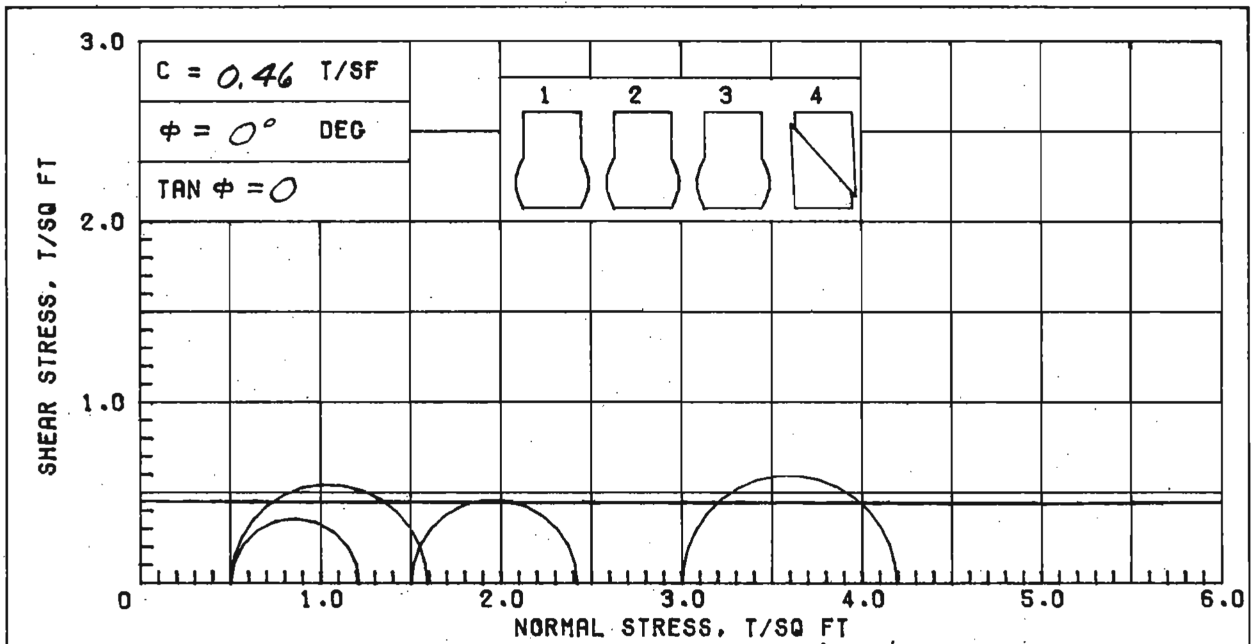
Avg. 51.7

CONTROLLED-STRAIN TEST

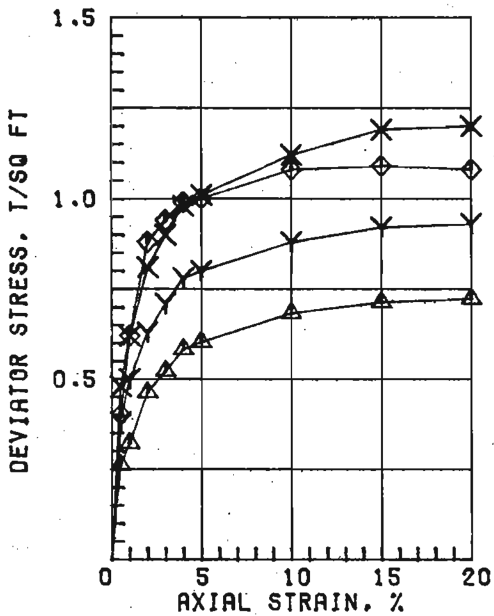
DESCRIPTION OF SPECIMENS: PLASTIC CLAY (CH), GRAY; SILT POCKETS & LENSES

LL 46	PL 16	PI 30	GS 2.70 (ESTIMATED)	UNDISTURBED SPECIMEN	Q TEST

REMARKS:	PROJECT LK PONT LA & VIC HURR PROT	
LIMITS ON MIXTURE OF MATERIAL.	ORLEANS PARISH OUTFALL CANALS	
	BORING NO. 4-OUG	SAMPLE NO. 10-C
	DEPTH/ELEV 36.5/-42.4	TECH. KOC
	LABORATORY USAE WES	DATE 19 DEC 84
	TRIAXIAL COMPRESSION TEST REPORT	



γsat. = 125



	SPECIMEN NO.	△1	Y2	X3	◇4
INITIAL	WATER CONTENT, %	25.6	25.0	24.2	24.0
INITIAL	DRY DENSITY, PCF	97.0	99.3	99.7	98.6
INITIAL	SATURATION, %	93.7	96.8	94.6	91.3
INITIAL	VOID RATIO	0.738	0.697	0.691	0.710
BEFORE SHEAR	WATER CONTENT, %				
BEFORE SHEAR	DRY DENSITY, PCF				
BEFORE SHEAR	SATURATION, %				
BEFORE SHEAR	VOID RATIO				
BEFORE SHEAR	BACK PRESS., TSF				
	MIN PRIN. STRESS, TSF	0.5	1.5	3.0	0.5
	MAX. DEV. STRESS, TSF	0.71	0.92	1.19	1.09
	TIME TO FAILURE, MIN.	30	30	30	30
	RATE OF STRAIN INCR,%				
	INITIAL DIAMETER, IN.	1.40	1.40	1.40	1.40
	INITIAL HEIGHT, IN.	3.00	3.00	3.00	3.00

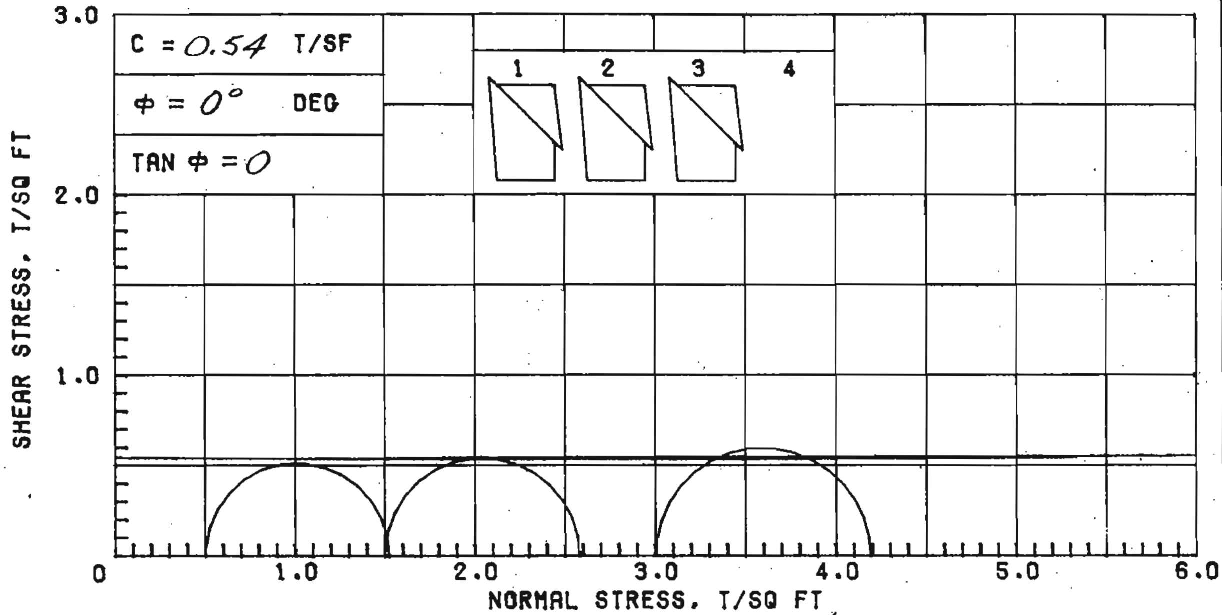
Avg. 24.7

CONTROLLED-STRAIN TEST

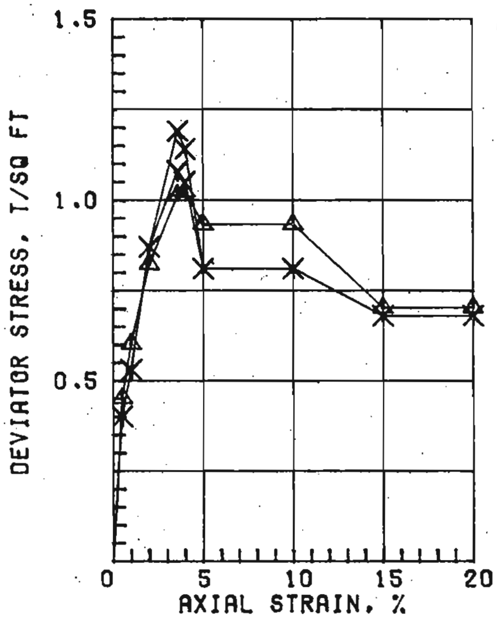
DESCRIPTION OF SPECIMENS; PLASTIC CLAY (CH), GRAY; CONCRETIONS

LL 52	PL 14	PI 38	GS 2.70 (ESTIMATED)	UNDISTURBED SPECIMEN	Q TEST

REMARKS;	
	PROJECT LK PONT LA & VIC HURR PROT ORLEANS PARISH OUTFALL CANALS
	BORING NO. 4-OUG / SAMPLE NO. 13-B
	DEPTH/ELEV 48.0/-53.9 / TECH. KOC
	LABORATORY USAE WES / DATE 20 DEC 84
	TRIAXIAL COMPRESSION TEST REPORT



γsat. = 110



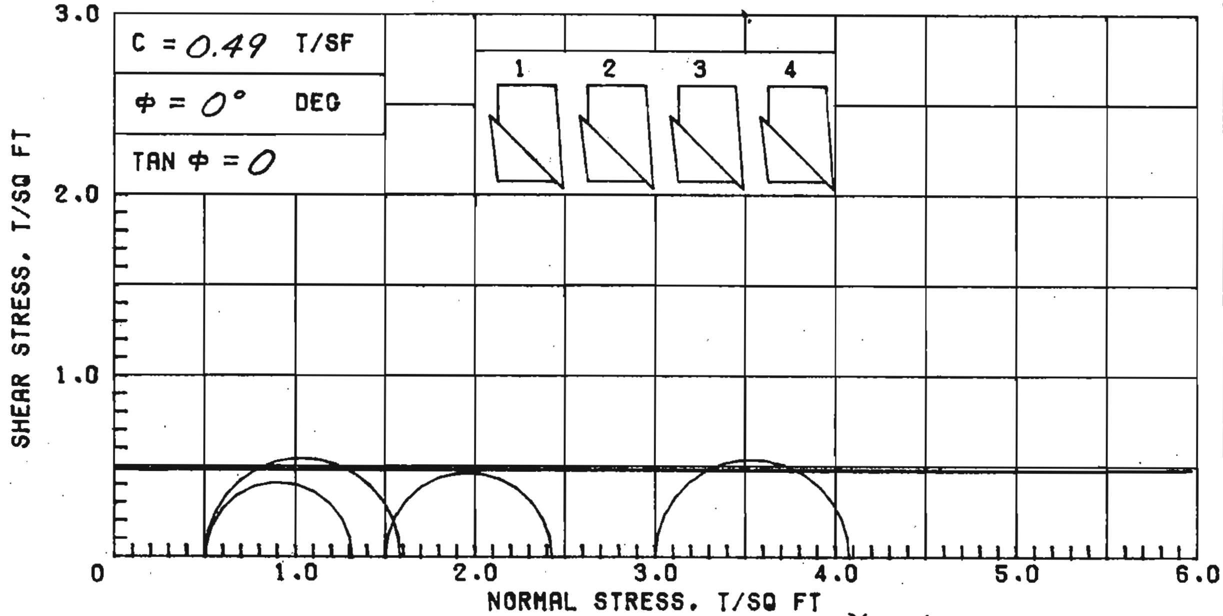
SPECIMEN NO.		△1	Y2	X3	Avg. 4
INITIAL	WATER CONTENT, %	47.3	44.3	45.0	45.5
	DRY DENSITY, PCF	73.9	77.1	76.0	
	SATURATION, %	99.7	100+	99.9	
	VOID RATIO	1.281	1.185	1.216	
BEFORE SHEAR	WATER CONTENT, %				
	DRY DENSITY, PCF				
	SATURATION, %				
	VOID RATIO				
	BACK PRESS., TSF				
MIN PRIN. STRESS, TSF		0.5	1.5	3.0	
MAX. DEV. STRESS, TSF		1.02	1.08	1.19	
TIME TO FAILURE, MIN.		8	7	7	
RATE OF STRAIN INCR.,%					
INITIAL DIAMETER, IN.		1.40	1.40	1.40	
INITIAL HEIGHT, IN.		3.00	3.00	3.00	

CONTROLLED-STRAIN TEST

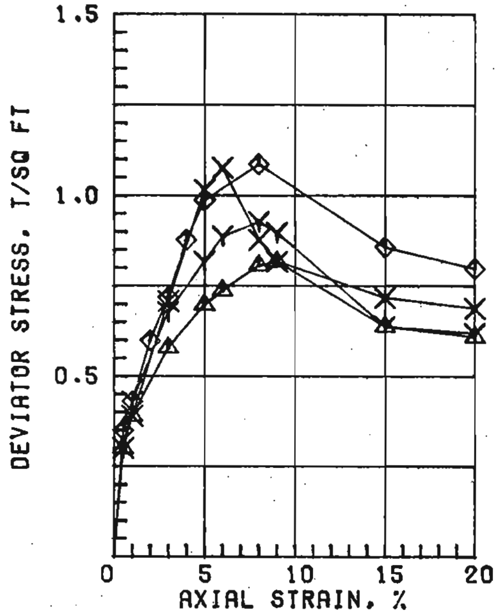
DESCRIPTION OF SPECIMENS: PLASTIC CLAY (CH), GRAY; SILT POCKETS & LENSES

LL 48	PL 22	PI 26	GS 2.70 (ESTIMATED)	UNDISTURBED SPECIMEN	Q TEST

REMARKS:	PROJECT LK PONT LA & VIC HURR PROT	
LIMITS ON MIXTURE OF MATERIAL.	ORLEANS PARISH OUTFALL CANALS	
	BORING NO. 4-OUG	SAMPLE NO. 22-B
	DEPTH/ELEV 84.0/-89.9	TECH. KOC
	LABORATORY USAE WES	DATE 20 DEC 84
	TRIAXIAL COMPRESSION TEST REPORT	



$\gamma_{sat} = 111$



	SPECIMEN NO.	△1	Y2	X3	◇4	
INITIAL	WATER CONTENT, %	45.1	43.3	43.4	41.8	Avg. 43.4
INITIAL	DRY DENSITY, PCF	76.3	77.0	77.4	77.7	
INITIAL	SATURATION, %	100+	98.3	99.5	96.6	
INITIAL	VOID RATIO	1.209	1.189	1.178	1.169	
BEFORE SHEAR	WATER CONTENT, %					
BEFORE SHEAR	DRY DENSITY, PCF					
BEFORE SHEAR	SATURATION, %					
BEFORE SHEAR	VOID RATIO					
BEFORE SHEAR	BACK PRESS., TSF					
	MIN PRIN. STRESS, TSF	0.5	1.5	3.0	0.5	
	MAX. DEV. STRESS, TSF	0.82	0.93	1.08	1.09	
	TIME TO FAILURE, MIN.	18	16	12	16	
	RATE OF STRAIN INCR,%					
	INITIAL DIAMETER, IN.	1.40	1.40	1.40	1.40	
	INITIAL HEIGHT, IN.	3.00	3.00	3.00	3.00	

CONTROLLED-STRAIN TEST

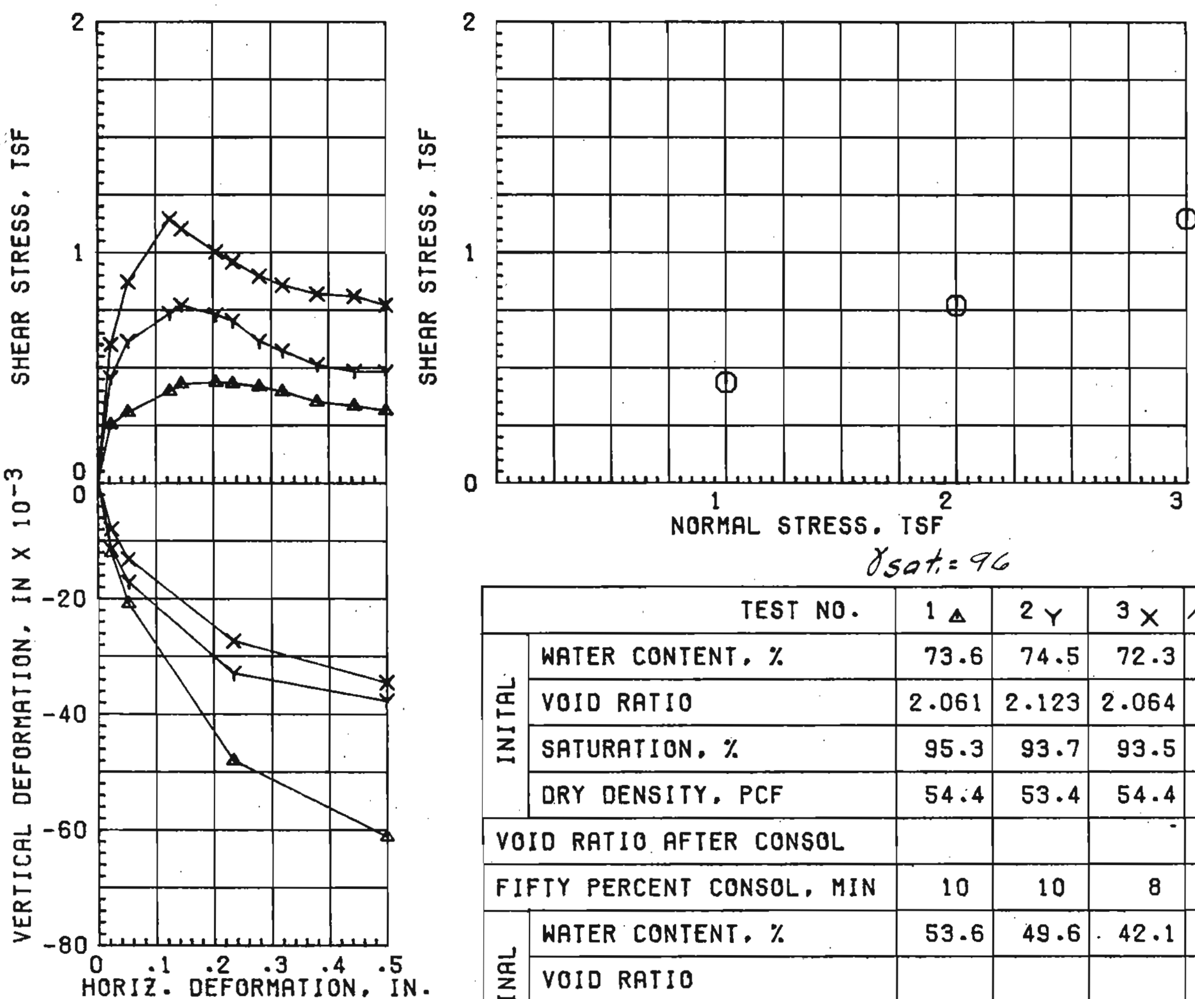
DESCRIPTION OF SPECIMENS: PLASTIC CLAY (CH), GRAY

LL 63	PL 19	PI 44	GS 2.70 (ESTIMATED)	UNDISTURBED SPECIMEN	Q TEST

REMARKS:

PROJECT LK PONT LA & VIC HURR PROT	
ORLEANS PARISH OUTFALL CANALS	
BORING NO. 4-OUG	SAMPLE NO. 23-C
DEPTH/ELEV 89.3/-95.2	TECH. KOC
LABORATORY USAE WES	DATE 21 DEC 84

TRIAXIAL COMPRESSION TEST REPORT



$\gamma sat. = 96$

TEST NO.		1 △	2 Y	3 X	Avg.
INITAL	WATER CONTENT, %	73.6	74.5	72.3	73.5
	VOID RATIO	2.061	2.123	2.064	
	SATURATION, %	95.3	93.7	93.5	
	DRY DENSITY, PCF	54.4	53.4	54.4	
VOID RATIO AFTER CONSOL					
FIFTY PERCENT CONSOL, MIN		10	10	8	
FINAL	WATER CONTENT, %	53.6	49.6	42.1	
	VOID RATIO				
	SATURATION, %				
NORMAL STRESS, TSF		1.0	2.0	3.0	
MAXIMUM SHEAR STRESS, TSF		0.44	0.77	1.14	
TIME TO FAILURE, MIN		1132	800	690	
RATE OF STRAIN, IN/MIN		.00018	.00018	.00018	
ULTIMATE SHEAR STRESS, TSF					

$\phi = 21°$

TAN ϕ = 0.3839

C = 0

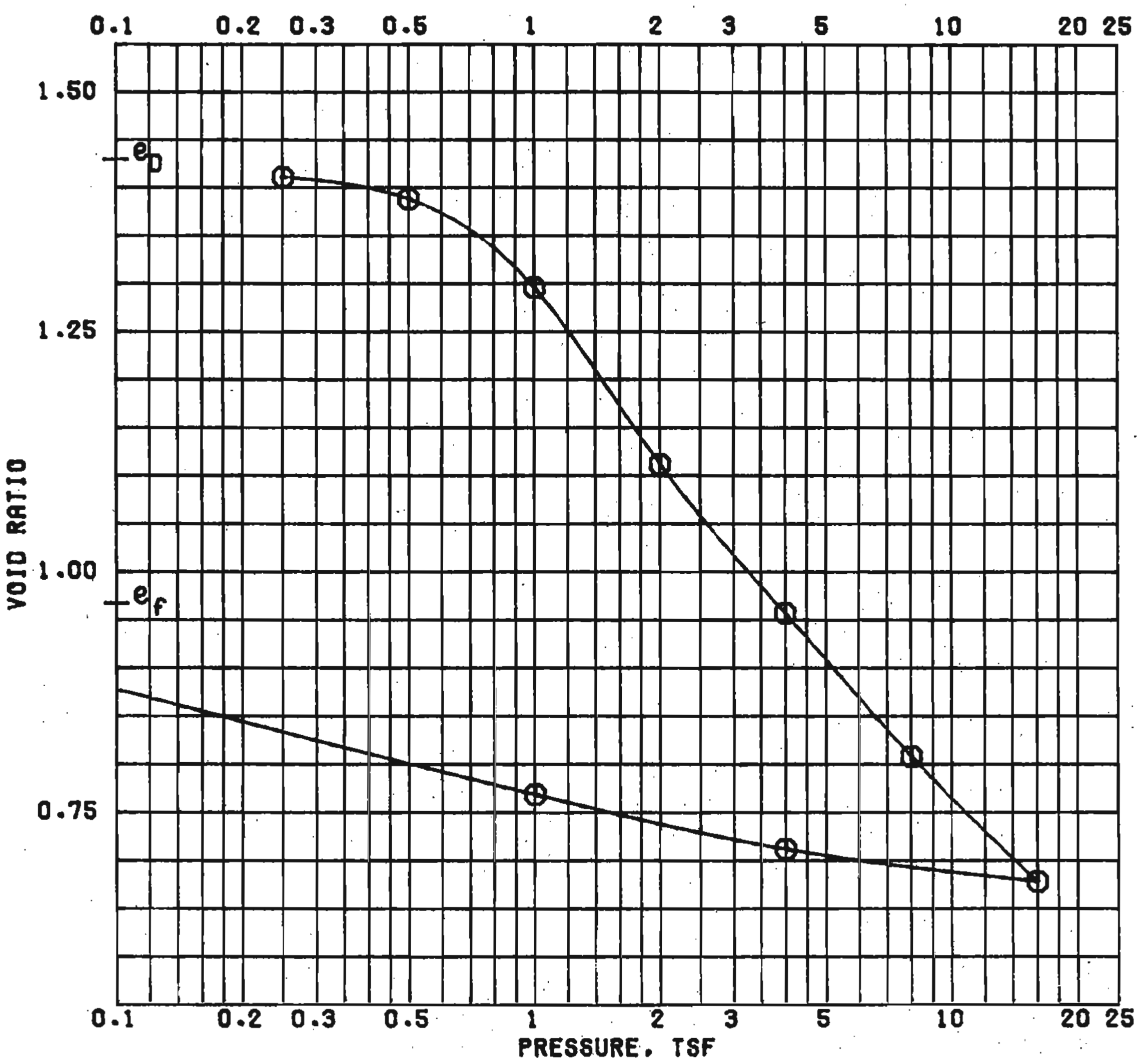
TYPE SPECIMEN UNDISTURBED	3.00 IN. SQUARE	0.553 IN. THICK

CLASSIFICATION PLASTIC CLAY (CH), GRAY

LL 90	PL 28	PI 62		GS 2.67 (EST)

REMARKS:	PROJECT LK PONT. LA. & VIC. HURR. PROT	
	ORLEANS PARISH OUTFALL CANALS	
	BORING NO. 4-OUG	SAMPLE 5C
	DEPTH/ELEV 16.4/-22.3	DATE 15 JAN 85

DIRECT SHEAR TEST REPORT



$\gamma_{sat.} = 106$

			BEFORE TEST	AFTER TEST
OVERBURDEN PRESSURE, TSF		WATER CONTENT, %	51.8	36.2
PRECONSOL. PRESSURE, TSF	0.45	DRY DENSITY, PCF	69.4	85.8
COMPRESSION INDEX		SATURATION, %	97.9	100 +
TYPE SPECIMEN	UNDISTURBED	VOID RATIO	1.428	0.966
DIA. IN 4.44	HT. IN 1.130	BACK PRESSURE, TSF		

CLASSIFICATION PLASTIC CLAY (CH), GRAY		
LL	PL	PI
GS 2.70 (EST)	D_{10}	
REMARKS		

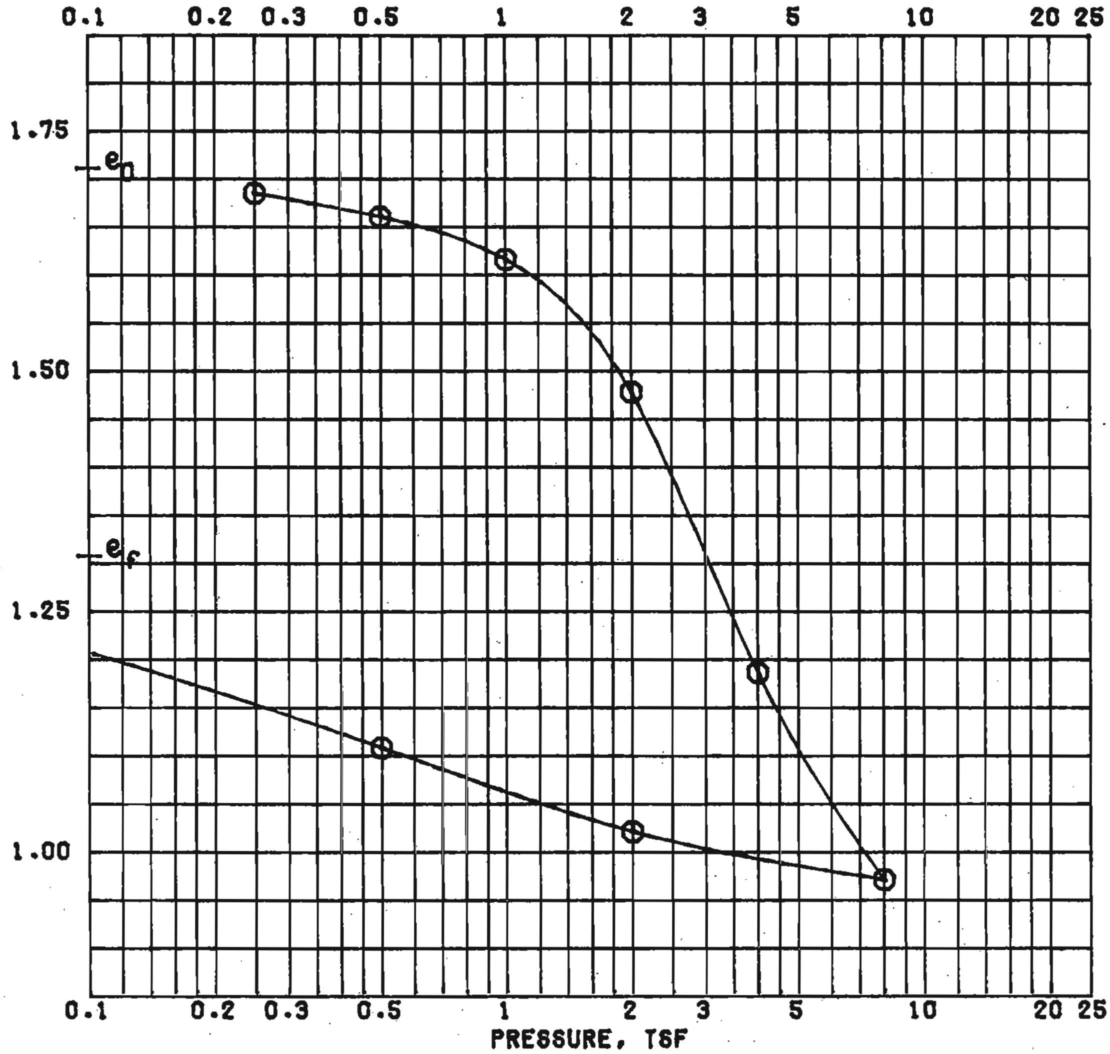
PROJECT LK PONT. LA. & VIC. HURR. PROT

ORLEANS PARISH OUTFALL CANALS

BORING NO. 4-OUG	SAMPLE NO. 4-C
DEPTH/ELEV 13.0/-18.9	DATE 13 DEC 84

CONSOLIDATION TEST REPORT

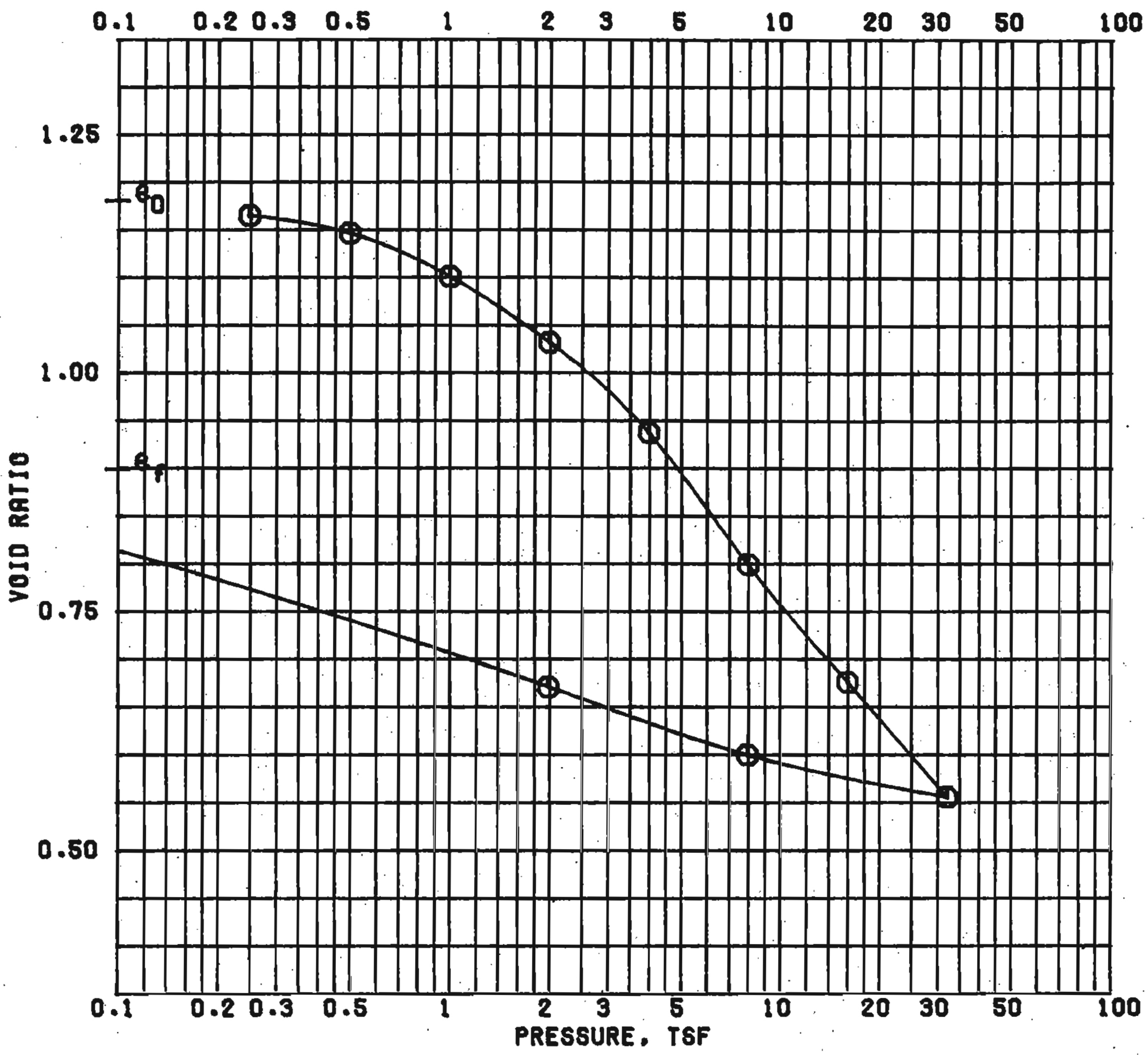
SHEET 1 OF 12



$\gamma_{sat} = 102$

			BEFORE TEST	AFTER TEST
OVERBURDEN PRESSURE, TSF		WATER CONTENT, %	60.5	47.2
PRECONSOL. PRESSURE, TSF	1.1	DRY DENSITY, PCF	62.2	73.1
COMPRESSION INDEX		SATURATION, %	95.5	97.6
TYPE SPECIMEN	UNDISTURBED	VOID RATIO	1.709	1.306
DIA. IN 4.44	HT. IN 1.129	BACK PRESSURE, TSF		
CLASSIFICATION	PLASTIC CLAY (CH), GRAY; SHELL PARTICLES			
LL	PL	PI	PROJECT LK PONT. LA. & VIC. HURR. PROT	
GS 2.70 (EST)	D_{10}		ORLEANS PARISH OUTFALL CANALS	
REMARKS			BORING NO. 4-OUG	SAMPLE NO. 11-B
			DEPTH/ELEV 40.1/-46.0	DATE 13 DEC 84
			CONSOLIDATION TEST REPORT	

SHEET 1 OF 11



$\gamma sat. = 111$

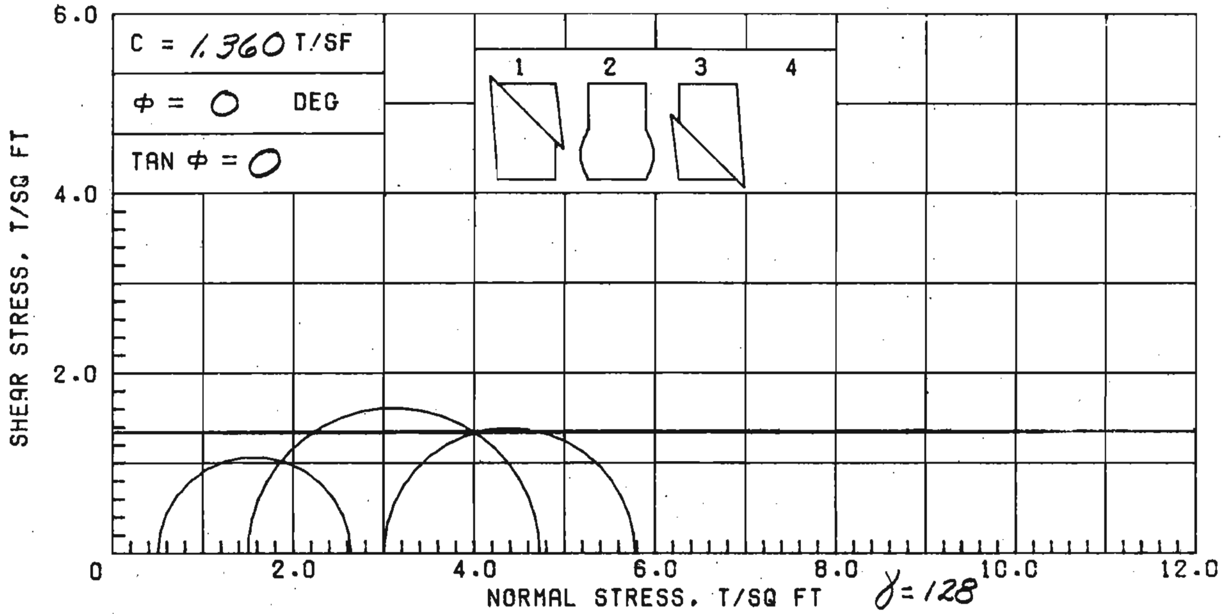
			BEFORE TEST	AFTER TEST
OVERBURDEN PRESSURE, TSF		WATER CONTENT, %	41.0	33.6
PRECONSOL. PRESSURE, TSF	1.95	DRY DENSITY, PCF	77.3	88.8
COMPRESSION INDEX		SATURATION, %	93.8	100 +
TYPE SPECIMEN	UNDISTURBED	VOID RATIO	1.179	0.897
DIA. IN 4.44	HT. IN 1.130	BACK PRESSURE, TSF		

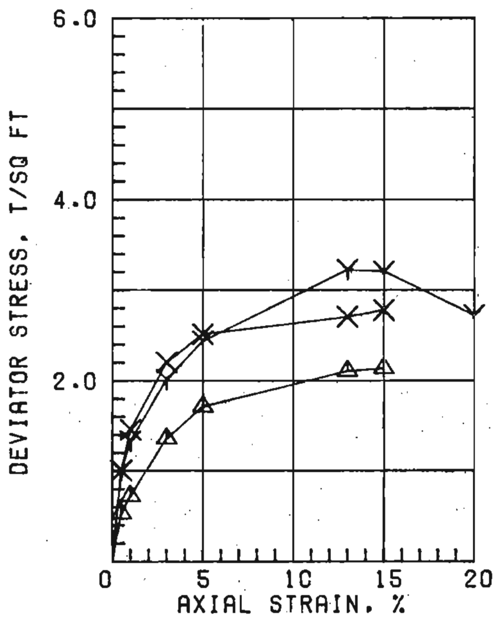
CLASSIFICATION PLASTIC CLAY (CH), GRAY; SILT LENSES

LL	PL	PI	PROJECT LK PONT. LA. & VIC. HURR. PROT
GS 2.70 (EST)	D_{10}		ORLEANS PARISH OUTFALL CANALS
REMARKS			BORING NO. 4-OUO / SAMPLE NO. 23-B
			DEPTH/ELEV 88.1/-94.0 / DATE 13 DEC 84

CONSOLIDATION TEST REPORT

SHEET 1 OF 13





	SPECIMEN NO.	△1	Y2	X3	Avg.
INITIAL	WATER CONTENT, %	21.8	20.8	21.5	21.4
	DRY DENSITY, PCF	102.8	104.8	105.6	
	SATURATION, %	92.0	92.3	97.4	
	VOID RATIO	0.640	0.609	0.596	
BEFORE SHEAR	WATER CONTENT, %				
	DRY DENSITY, PCF				
	SATURATION, %				
	VOID RATIO				
	BACK PRESS., TSF				
	MIN PRIN. STRESS, TSF	0.5	1.5	3.0	
	MAX. DEV. STRESS, TSF	2.14	3.23	2.78	
	TIME TO FAILURE, MIN.	30	26	30	
	RATE OF STRAIN INCR.,%				
	INITIAL DIAMETER, IN.	1.39	1.39	1.39	
	INITIAL HEIGHT, IN.	3.00	3.00	3.00	

CONTROLLED-STRAIN TEST

DESCRIPTION OF SPECIMENS: CLAY (CL), GRAY; PLASTIC CLAY (CH) POCKETS

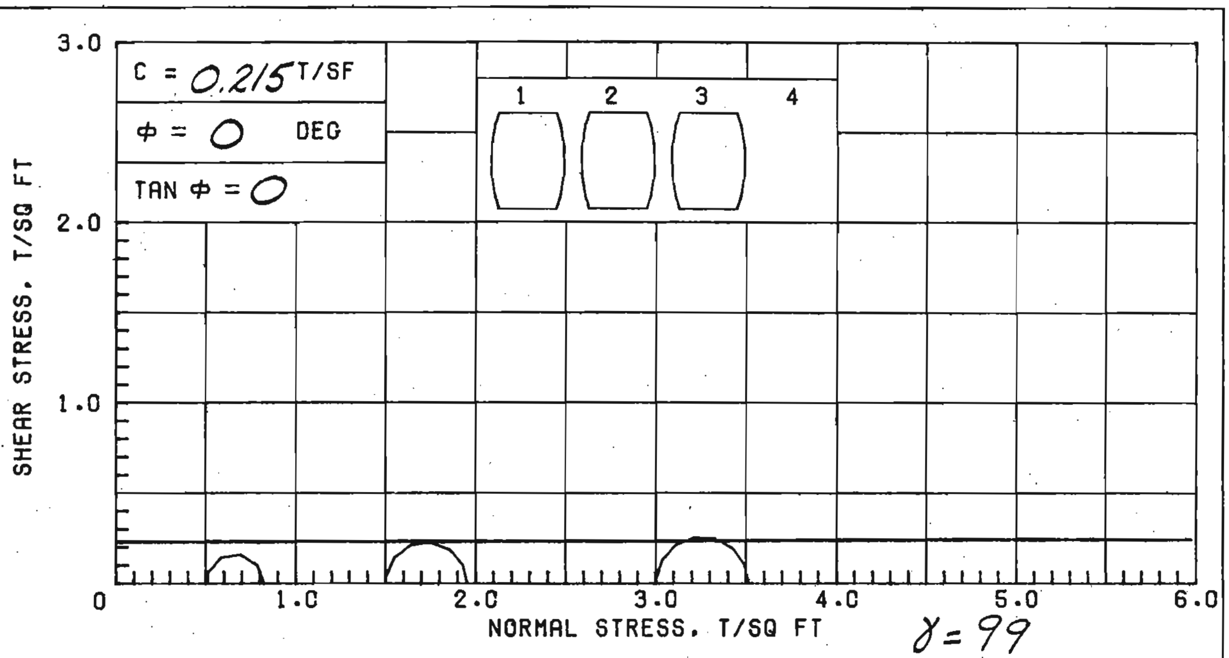
LL 36	PL 17	PI 19	GS 2.70 (ESTIMATED)	UNDISTURBED SPECIMEN	Q TEST

REMARKS:

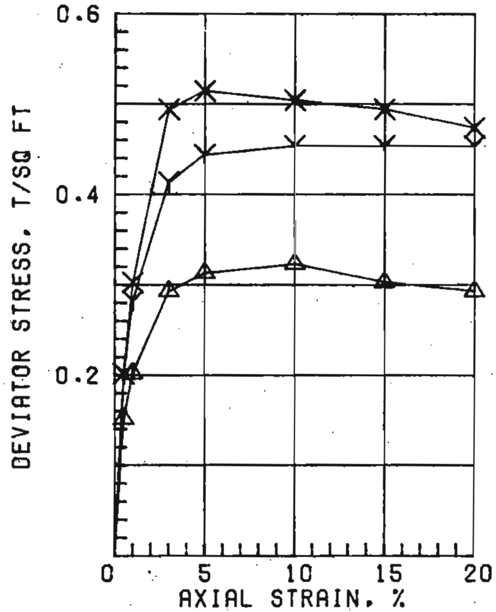
PROJECT LAKE PONT. LA. & VIC. HURR. PROT ORLEANS PARISH OUTFALL CANALS	
BORING NO. 5-OUG	SAMPLE NO. 2-C
DEPTH/ELEV 7.3/+1.9	TECH. KOC
LABORATORY USAE WES	DATE 02 DEC 85

TRIAXIAL COMPRESSION TEST REPORT

Incl 2



γ = 99

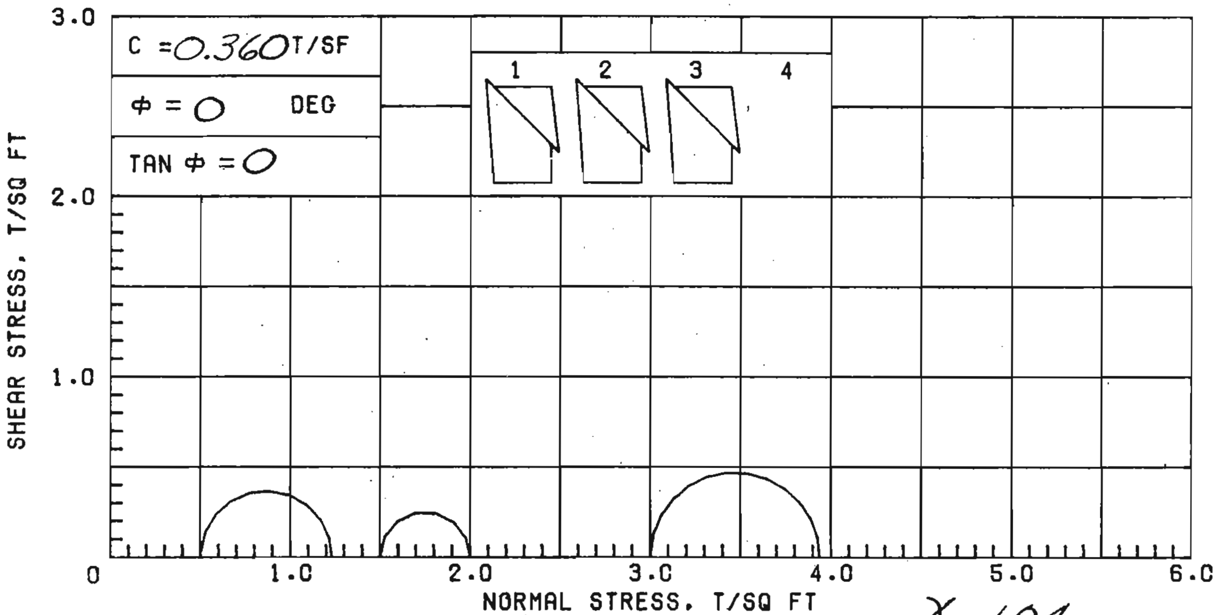


		SPECIMEN NO.	Δ1	Y2	X3	Avg.
INITIAL		WATER CONTENT, %	57.0	54.8	53.9	55.2
		DRY DENSITY, PCF	57.1	58.1	58.8	
		SATURATION, %	78.9	77.8	77.9	
		VOID RATIO	1.951	1.901	1.868	
BEFORE SHEAR		WATER CONTENT, %				
		DRY DENSITY, PCF				
		SATURATION, %				
		VOID RATIO				
		BACK PRESS., TSF				
		MIN PRIN. STRESS, TSF	0.5	1.5	3.0	
		MAX. DEV. STRESS, TSF	0.32	0.45	0.51	
		TIME TO FAILURE, MIN.	20	20	10	
		RATE OF STRAIN INCR.%				
		INITIAL DIAMETER, IN.	1.39	1.39	1.39	
CONTROLLED-STRAIN TEST		INITIAL HEIGHT, IN.	3.00	3.00	3.00	

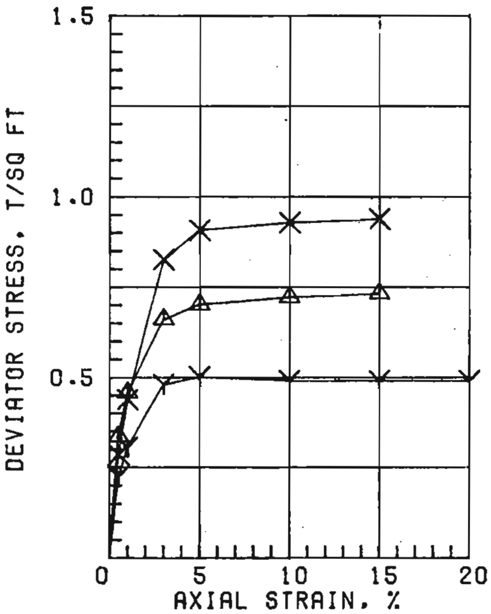
DESCRIPTION OF SPECIMENS: PLASTIC CLAY (CH), DARK GRAY; ORGANIC MATERIAL

LL 62	PL 28	PI 34	GS 2.70 (ESTIMATED)	UNDISTURBED SPECIMEN	Q TEST

REMARKS:	PROJECT LAKE PONT. LA. & VIC. HURR. PROT	
	ORLEANS PARISH OUTFALL CANALS	
	BORING NO. 5-OUG	SAMPLE NO. 3-C
	DEPTH/ELEV 11.0/-1.8	TECH. KOC
	LABORATORY USAE WES	DATE 04 DEC 85
	TRIAXIAL COMPRESSION TEST REPORT	



γ = 104



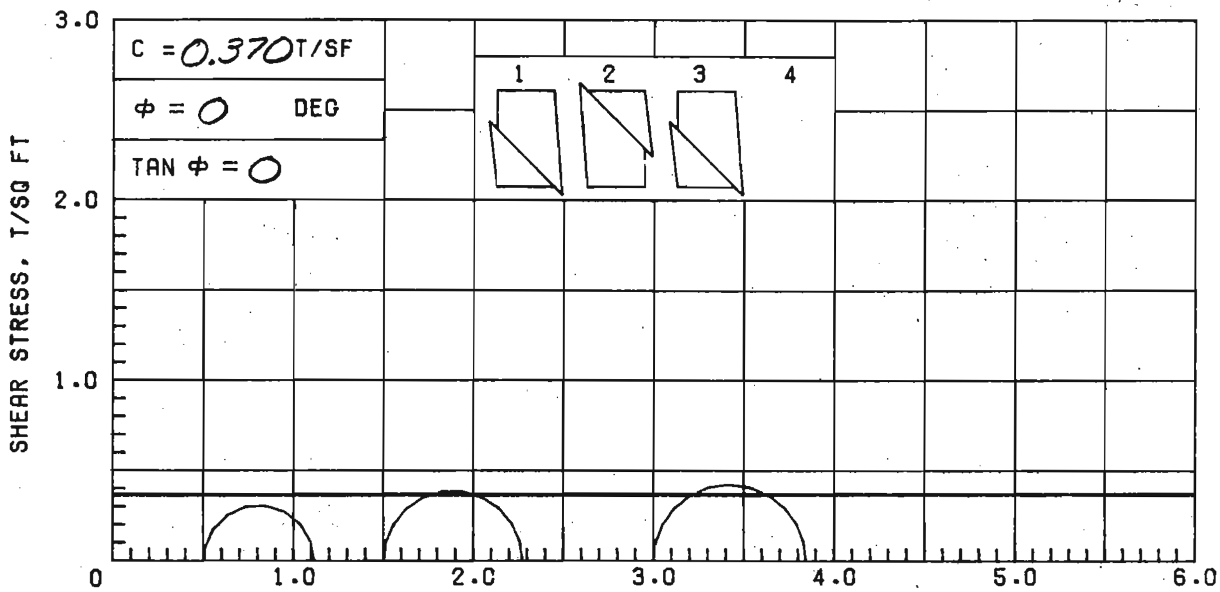
		△1	Y2	X3	Avg.
SPECIMEN NO.		△1	Y2	X3	Avg.
INITIAL	WATER CONTENT, %	45.6	60.6	51.4	52.5
	DRY DENSITY, PCF	73.2	60.2	65.4	
	SATURATION, %	94.4	91.0	87.9	
	VOID RATIO	1.304	1.798	1.579	
BEFORE SHEAR	WATER CONTENT, %				
	DRY DENSITY, PCF				
	SATURATION, %				
	VOID RATIO				
	BACK PRESS., TSF				
MIN PRIN. STRESS, TSF		0.5	1.5	3.0	
MAX. DEV. STRESS, TSF		0.73	0.50	0.94	
TIME TO FAILURE, MIN.		30	10	30	
RATE OF STRAIN INCR.%					
INITIAL DIAMETER, IN.		1.39	1.38	1.39	
INITIAL HEIGHT, IN.		3.00	3.00	3.00	

CONTROLLED-STRAIN TEST

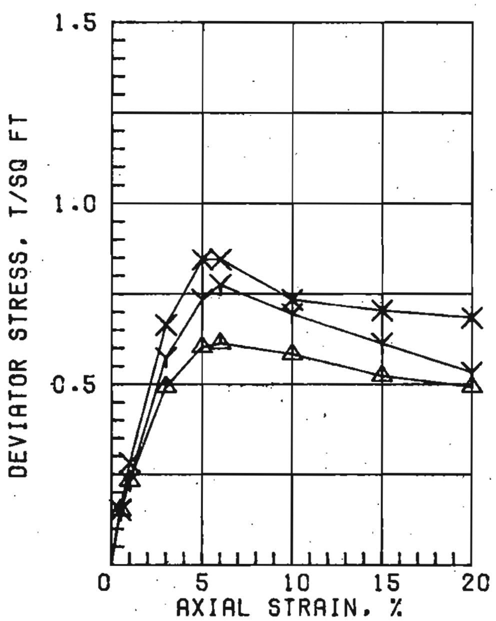
DESCRIPTION OF SPECIMENS: PLASTIC CLAY (CH), DARK GRAY; ORGANIC MATERIAL

LL 75	PL 27	PI 48	GS 2.70 (ESTIMATED)	UNDISTURBED SPECIMEN	Q TEST

REMARKS:	PROJECT LAKE PONT. LA. & VIC. HURR. PROT	
INSUFFICIENT MATERIAL FOR	ORLEANS PARISH OUTFALL CANALS	
CHECK TEST.	BORING NO. 5-OUG	SAMPLE NO. 4-D
	DEPTH/ELEV 15.3/-6.1	TECH. KOC
	LABORATORY USAE WES	DATE 06 JAN 86
	TRIAXIAL COMPRESSION TEST REPORT	



γ = 76



SPECIMEN NO.		Δ1	Y2	X3	Avg.
INITIAL	WATER CONTENT, %	221.6	233.3	234.1	229.7
	DRY DENSITY, PCF	22.2	21.4	21.2	
	SATURATION, %	92.7	93.3	92.5	
	VOID RATIO	5.735	5.999	6.073	
BEFORE SHEAR	WATER CONTENT, %				
	DRY DENSITY, PCF				
	SATURATION, %				
	VOID RATIO				
	BACK PRESS., TSF				
MIN PRIN. STRESS, TSF		0.5	1.5	3.0	
MAX. DEV. STRESS, TSF		0.61	0.77	0.84	
TIME TO FAILURE, MIN.		12	12	10	
RATE OF STRAIN INCR.%					
INITIAL DIAMETER, IN.		1.40	1.40	1.40	
INITIAL HEIGHT, IN.		3.00	3.00	3.00	

CONTROLLED-STRAIN TEST

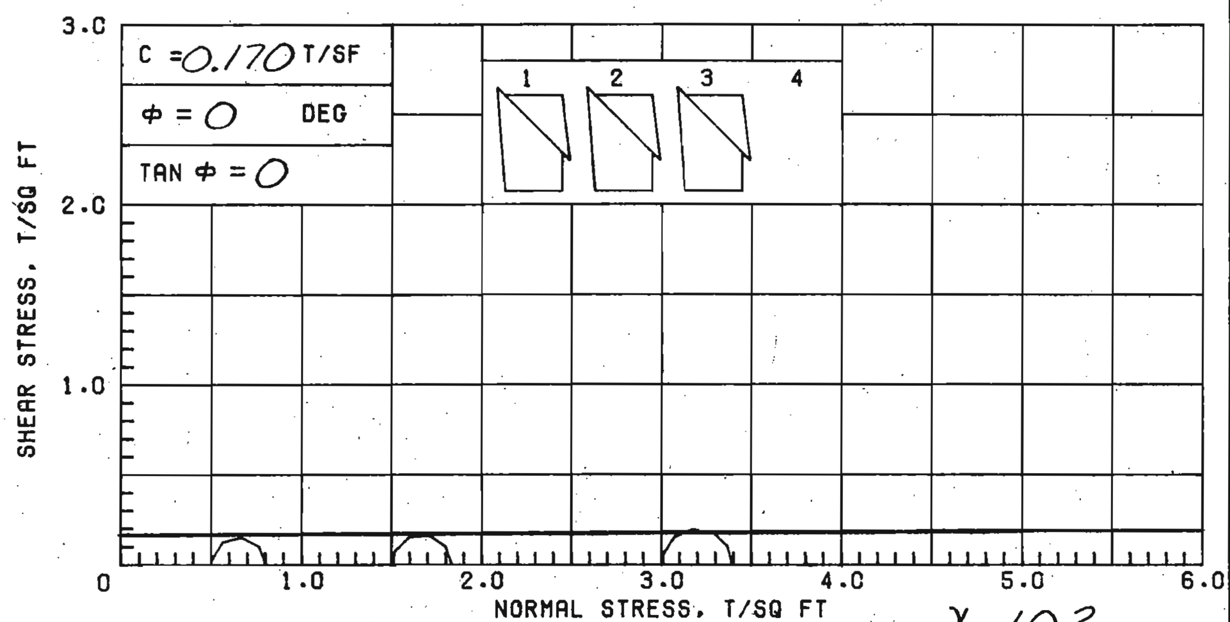
DESCRIPTION OF SPECIMENS: ORGANIC CLAY (OH), DARK GRAY

LL 313	PL 111	PI 202	GS 2.40 (ESTIMATED)	UNDISTURBED SPECIMEN	Q TEST

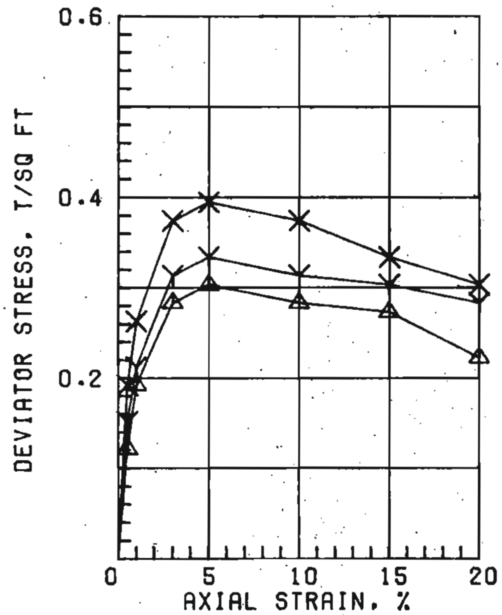
REMARKS:

PROJECT LAKE PONT. LA. & VIC. HURR. PROT	
ORLEANS PARISH OUTFALL CANALS	
BORING NO. 5-OUG	SAMPLE NO. 6-B
DEPTH/ELEV 21.5/-12.3	TECH. KOC
LABORATORY USAE WES	DATE 06 JAN 86

TRIAXIAL COMPRESSION TEST REPORT



γ=102



	SPECIMEN NO.	Δ1	Y2	X3	Avg.
INITIAL	WATER CONTENT, %	60.3	63.4	60.4	61.4
	DRY DENSITY, PCF	63.6	61.6	63.8	
	SATURATION, %	98.8	98.7	99.3	
	VOID RATIO	1.648	1.735	1.642	
BEFORE SHEAR	WATER CONTENT, %				
	DRY DENSITY, PCF				
	SATURATION, %				
	VOID RATIO				
	BACK PRESS., TSF				
	MIN PRIN. STRESS, TSF	0.5	1.5	3.0	
	MAX. DEV. STRESS, TSF	0.30	0.33	0.39	
	TIME TO FAILURE, MIN.	10	10	10	
	RATE OF STRAIN INCR.,%				
	INITIAL DIAMETER, IN.	1.39	1.39	1.39	
	INITIAL HEIGHT, IN.	3.00	3.00	3.00	

CONTROLLED-STRAIN TEST

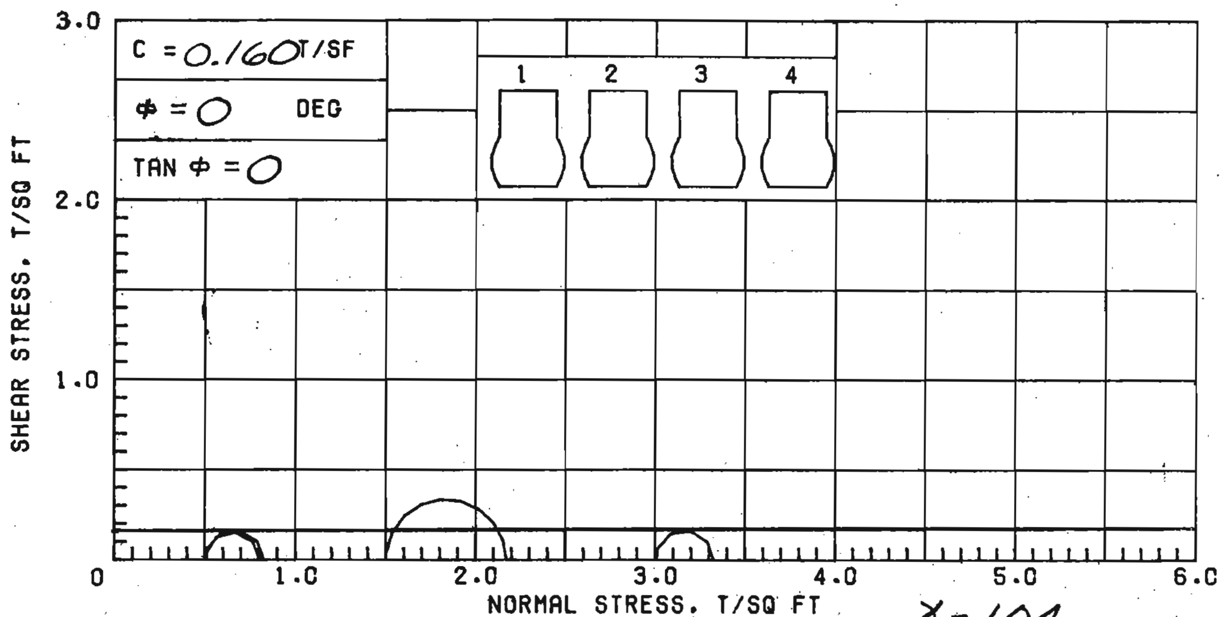
DESCRIPTION OF SPECIMENS: PLASTIC CLAY (CH), GRAY

LL 69	PL 21	PI 48	GS 2.70 (ESTIMATED)	UNDISTURBED SPECIMEN	Q TEST

REMARKS:

PROJECT LAKE PONT. LA. & VIC. HURR. PROT ORLEANS PARISH OUTFALL CANALS	
BORING NO. 5-0UG	SAMPLE NO. 8-C
DEPTH/ELEV 30.3/-21.1	TECH. KOC
LABORATORY USAE WES	DATE 08 JAN 86

TRIAXIAL COMPRESSION TEST REPORT



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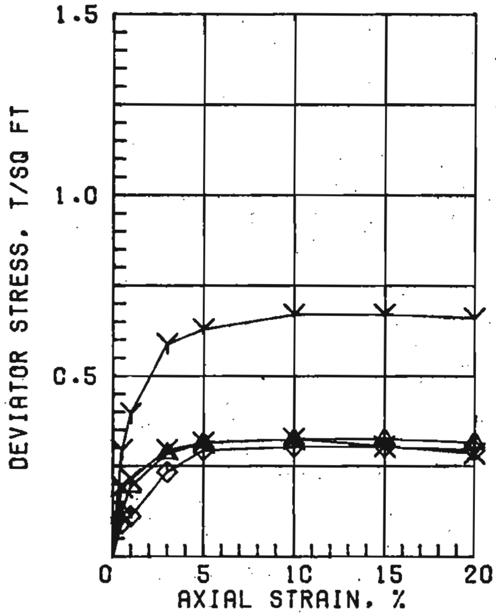


	SPECIMEN NO.	△1	Y2	X3	◇4
INITIAL	WATER CONTENT, %	32.9	28.7	43.0	38.0
	DRY DENSITY, PCF	82.3	85.9	77.0	79.5
	SATURATION, %	84.7	80.5	97.6	91.7
	VOID RATIO	1.048	0.963	1.190	1.119
BEFORE SHEAR	WATER CONTENT, %				
	DRY DENSITY, PCF				
	SATURATION, %				
	VOID RATIO				
	BACK PRESS., TSF				
	MIN PRIN. STRESS, TSF	0.5	1.5	3.0	0.5
	MAX. DEV. STRESS, TSF	0.33	0.67	0.33	0.30
	TIME TO FAILURE, MIN.	20	20	20	20
	RATE OF STRAIN INCR,%				
	INITIAL DIAMETER, IN.	1.39	1.39	1.39	1.39
	INITIAL HEIGHT, IN.	3.00	3.00	3.00	3.00

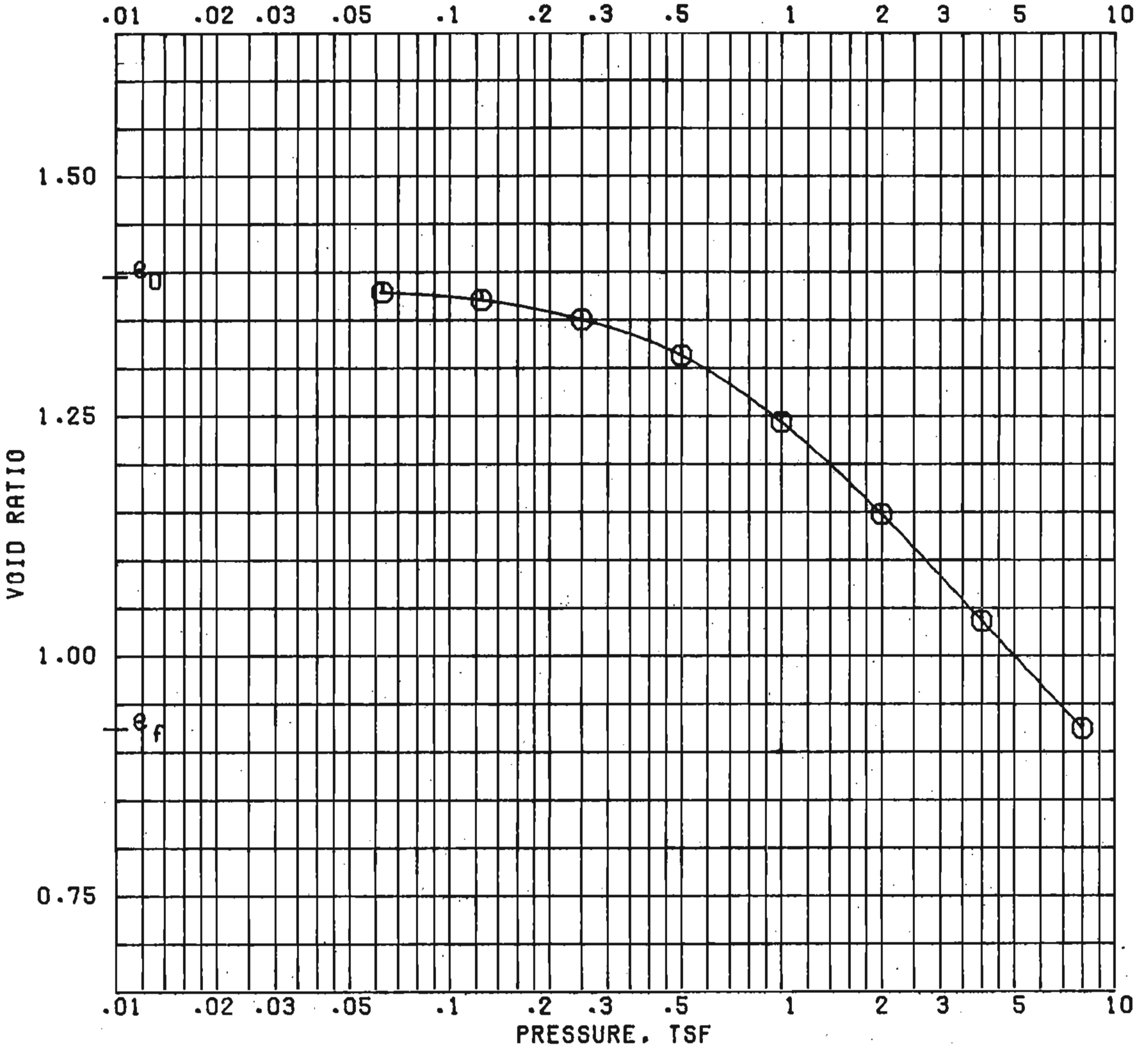
Avg. 38.0

CONTROLLED-STRAIN TEST

DESCRIPTION OF SPECIMENS: CLAY (CL), GRAY; FINE SAND POCKETS

LL 34	PL 14	PI 20	GS 2.70 (ESTIMATED)	UNDISTURBED SPECIMEN	Q TEST

REMARKS:	PROJECT LAKE PONT. LA. & VIC. HURR. PROT	
	ORLEANS PARISH OUTFALL CANALS	
	BORING NO. 5-OUG	SAMPLE NO. 1C-C
	DEPTH/ELEV 38.6/-29.4	TECH. KOC
	LABORATORY USAE WES	DATE 07 JAN 86
	TRIAXIAL COMPRESSION TEST REPORT	



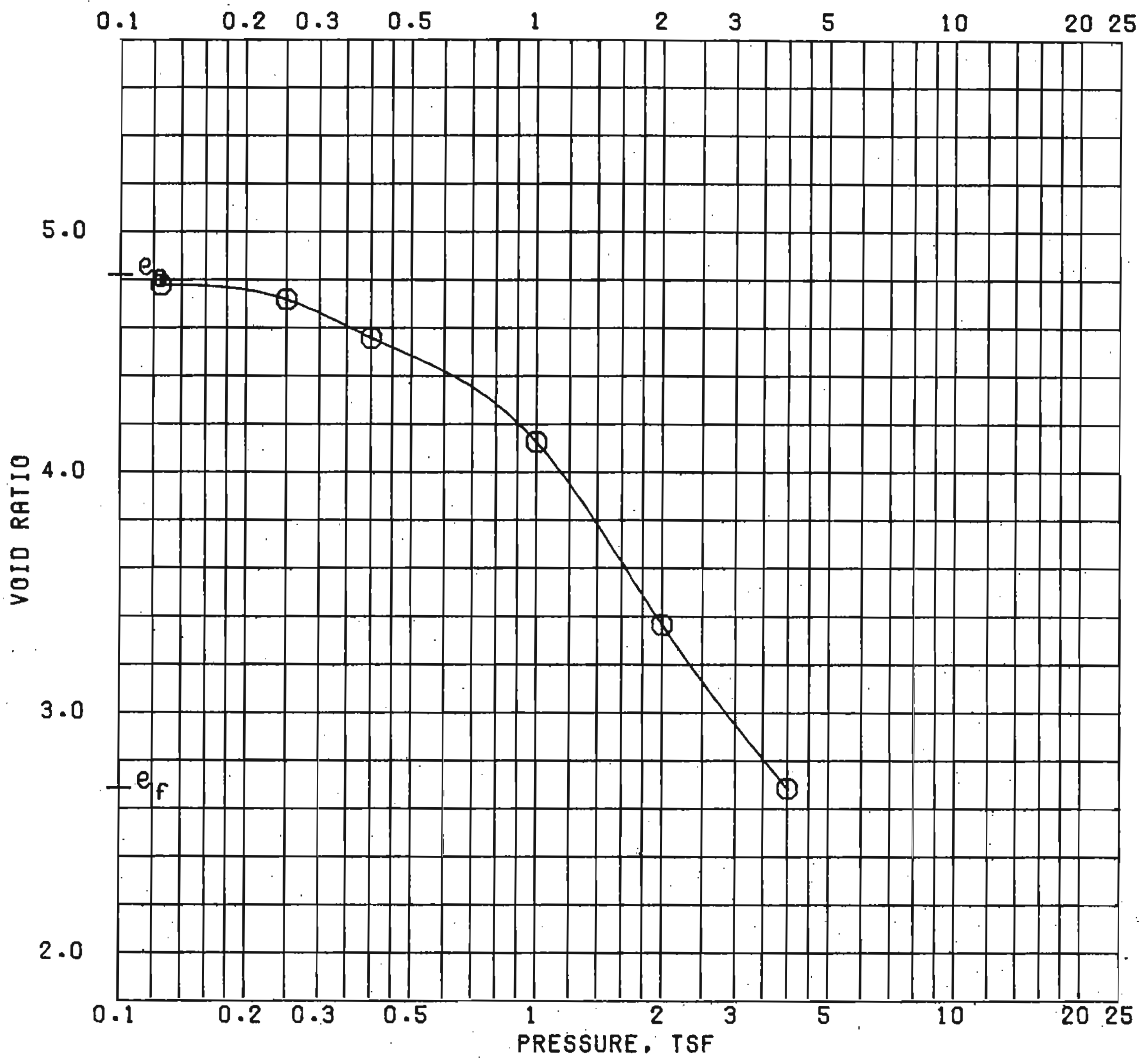
			BEFORE TEST	AFTER TEST
OVERBURDEN PRESSURE, TSF		WATER CONTENT, %	46.9	33.1
PRECONSOL. PRESSURE, TSF	0.60	DRY DENSITY, PCF	70.4	87.7
COMPRESSION INDEX		SATURATION, %	90.8	96.9
TYPE SPECIMEN	UNDISTURBED	VOID RATIO	1.394	0.922
DIA. IN 4.44	HT. IN 1.130	BACK PRESSURE, TSF		

CLASSIFICATION PLASTIC CLAY (CH), BROWNISH GRAY; ORGANIC MATERIAL

LL	PL	PI	PROJECT LAKE PONT LA & VIC HURR PROT	
GS 2.70 (EST)	D_{10}		ORLEANS PARISH OUTFALL CANALS	
REMARKS			BORING NO. 5-OUG	SAMPLE NO. 4-B
			DEPTH/ELEV 13.5/-4.3	DATE 06 JAN 86

CONSOLIDATION TEST REPORT

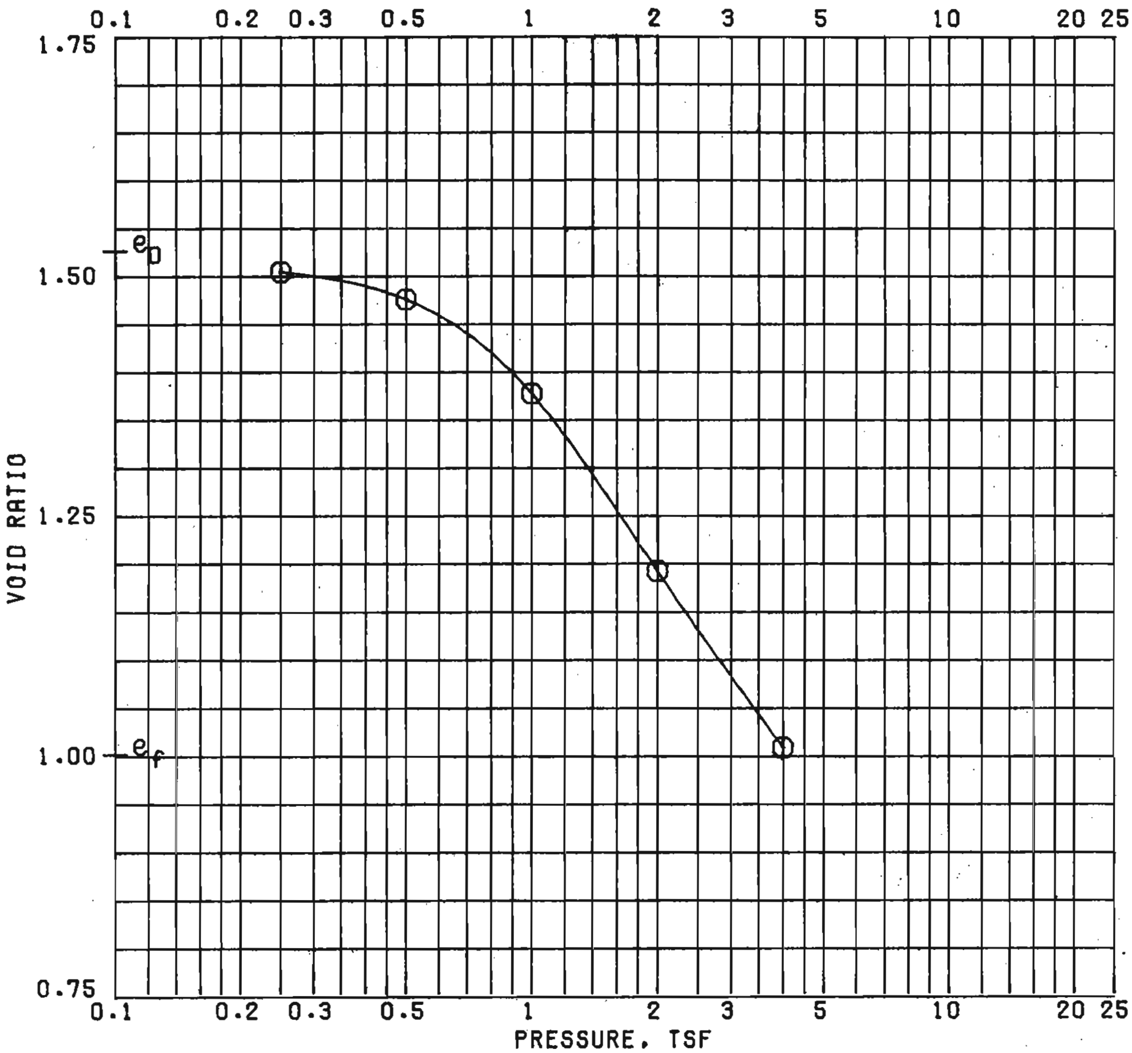
SHEET 1 OF 9



			BEFORE TEST	AFTER TEST
OVERBURDEN PRESSURE, TSF		WATER CONTENT, %	191.2	108.1
PRECONSOL. PRESSURE, TSF	0.68	DRY DENSITY, PCF	25.8	40.8
COMPRESSION INDEX		SATURATION, %	95.3	96.9
TYPE SPECIMEN	UNDISTURBED	VOID RATIO	4.814	2.677
DIA. IN 4.44	HT. IN 1.136	BACK PRESSURE, TSF		

CLASSIFICATION ORGANIC CLAY (OH), DARK GRAY				
LL	PL	PI	PROJECT LAKE PONT LA & VIC HURR PROT	
GS 2.40 (EST)	D_{10}		ORLEANS PARISH OUTFALL CANALS	
REMARKS			BORING NO. 5-OUG	SAMPLE NO. 6-B
			DEPTH/ELEV 21.3/-12.1	DATE 28 JAN 86
			CONSOLIDATION TEST REPORT	

SHEET 1 OF 8



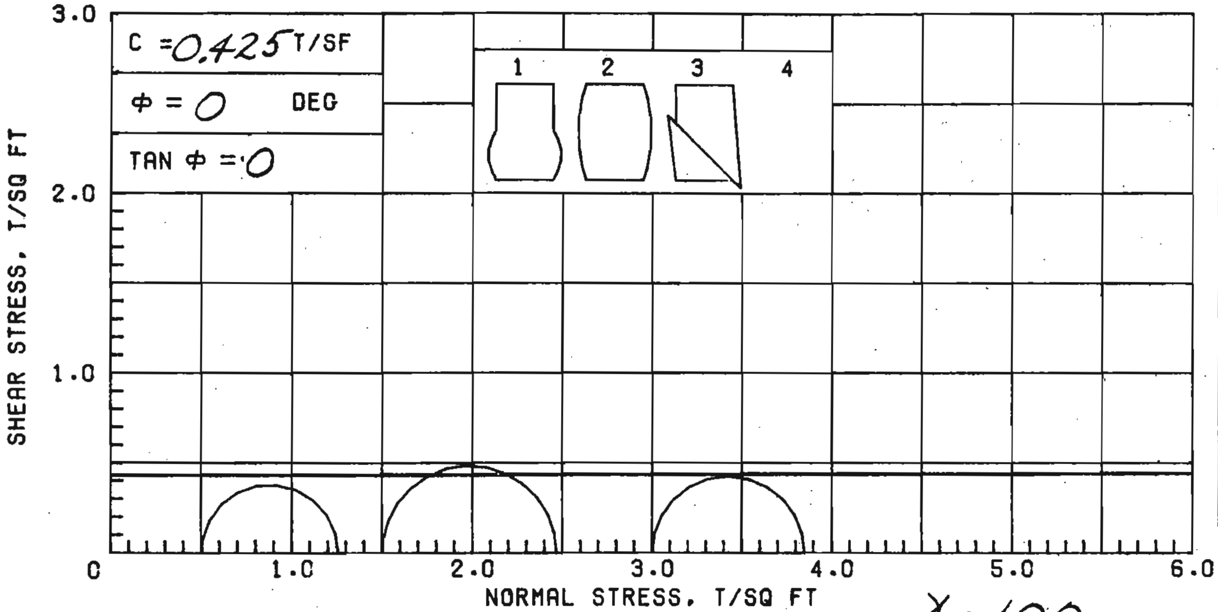
			BEFORE TEST	AFTER TEST
OVERBURDEN PRESSURE, TSF		WATER CONTENT, %	54.5	38.2
PRECONSOL. PRESSURE, TSF	0.78	DRY DENSITY, PCF	66.8	84.3
COMPRESSION INDEX		SATURATION, %	96.5	100 +
TYPE SPECIMEN	UNDISTURBED	VOID RATIO	1.525	1.000
DIA. IN 4.44	HT. IN 1.109	BACK PRESSURE, TSF		

CLASSIFICATION PLASTIC CLAY (CH), GRAY; SHELL PARTICLES		
LL	PL	PI
GS 2.70 (EST)	D_{10}	

PROJECT LAKE PONT LA & VIC HURR PROT		
ORLEANS PARISH OUTFALL CANALS		
REMARKS	BORING NO. 5-OUG	SAMPLE NO. 8-C
	DEPTH/ELEV 30.9/-21.7	DATE 06 JAN 86

CONSOLIDATION TEST REPORT

SHEET 1 OF 7



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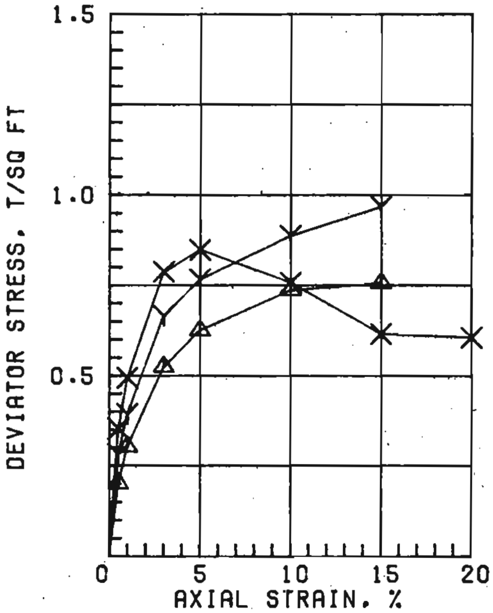


		SPECIMEN NO.	△1	Y2	X3	Avg.
INITIAL		WATER CONTENT, %	62.3	53.5	67.0	60.9
		DRY DENSITY, PCF	59.1	64.5	57.2	
		SATURATION, %	90.8	89.5	92.9	
		VOID RATIO	1.853	1.614	1.947	
BEFORE SHEAR		WATER CONTENT, %				
		DRY DENSITY, PCF				
		SATURATION, %				
		VOID RATIO				
		BACK PRESS., TSF				
MIN PRIN. STRESS, TSF			0.5	1.5	3.0	
MAX. DEV. STRESS, TSF			0.76	0.97	0.85	
TIME TO FAILURE, MIN.			30	30	10	
RATE OF STRAIN INCR,%						
INITIAL DIAMETER, IN.			1.39	1.39	1.39	
INITIAL HEIGHT, IN.			3.00	3.00	3.00	

CONTROLLED-STRAIN TEST

DESCRIPTION OF SPECIMENS: PLASTIC CLAY (CH), GRAY; ORGANIC MATERIAL

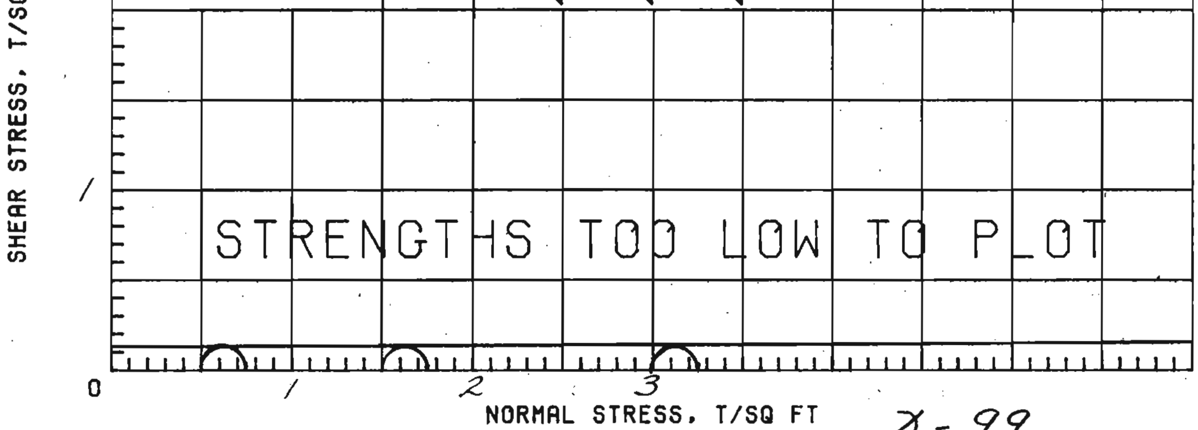
LL 71	PL 26	PI 45	GS 2.70 (ESTIMATED)	UNDISTURBED SPECIMEN	Q TEST

REMARKS;	PROJECT LAKE PONT. LA. & VIC. HURR. PROT	
	ORLEANS PARISH OUTFALL CANALS	
	BORING NO. 6-OUG	SAMPLE NO. 1-B
	DEPTH/ELEV 1.0/-2.5	TECH. KOC
	LABORATORY USAE WES	DATE 08 JAN 86
	TRIAXIAL COMPRESSION TEST REPORT	

C = 0.115 T/SF

φ = 0 DEG

TAN φ = 0



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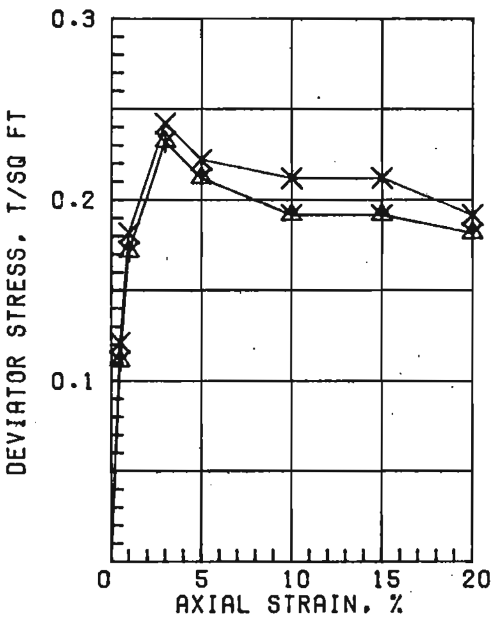


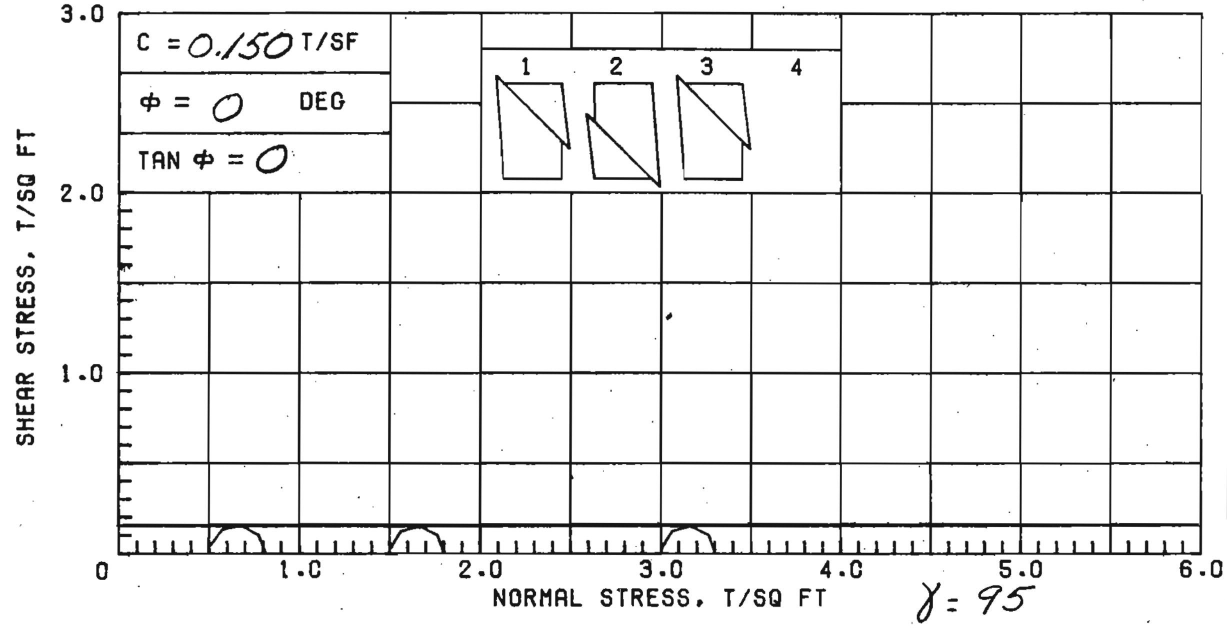
	SPECIMEN NO.	Δ1	Y2	X3	Avg.
INITIAL	WATER CONTENT, %	73.4	69.5	69.2	71
INITIAL	DRY DENSITY, PCF	55.9	58.0	57.9	
INITIAL	SATURATION, %	98.4	98.4	97.8	
INITIAL	VOID RATIO	2.013	1.908	1.910	
BEFORE SHEAR	WATER CONTENT, %				
BEFORE SHEAR	DRY DENSITY, PCF				
BEFORE SHEAR	SATURATION, %				
BEFORE SHEAR	VOID RATIO				
BEFORE SHEAR	BACK PRESS., TSF				
	MIN PRIN. STRESS, TSF	0.5	1.5	3.0	
	MAX. DEV. STRESS, TSF	0.23	0.23	0.24	
	TIME TO FAILURE, MIN.	6	6	6	
	RATE OF STRAIN INCR.,%				
	INITIAL DIAMETER, IN.	1.39	1.39	1.39	
	INITIAL HEIGHT, IN.	3.00	3.00	3.00	

CONTROLLED-STRAIN TEST

DESCRIPTION OF SPECIMENS: PLASTIC CLAY (CH), GRAY

LL 73	PL 22	PI 51	GS 2.70 (ESTIMATED)	UNDISTURBED SPECIMEN	Q TEST

REMARKS:	PROJECT LAKE PONT. LA. & VIC. HURR. PROT	
	ORLEANS PARISH OUTFALL CANALS	
	BORING NO. 6-OUG	SAMPLE NO. 5-B
	DEPTH/ELEV 17.6/-19.1	TECH. KOC
	LABORATORY USAE WES	DATE 09 JAN 86
	TRIAXIAL COMPRESSION TEST REPORT	



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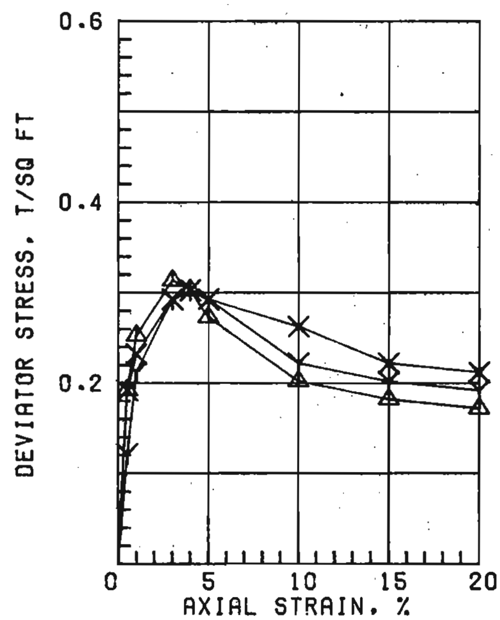


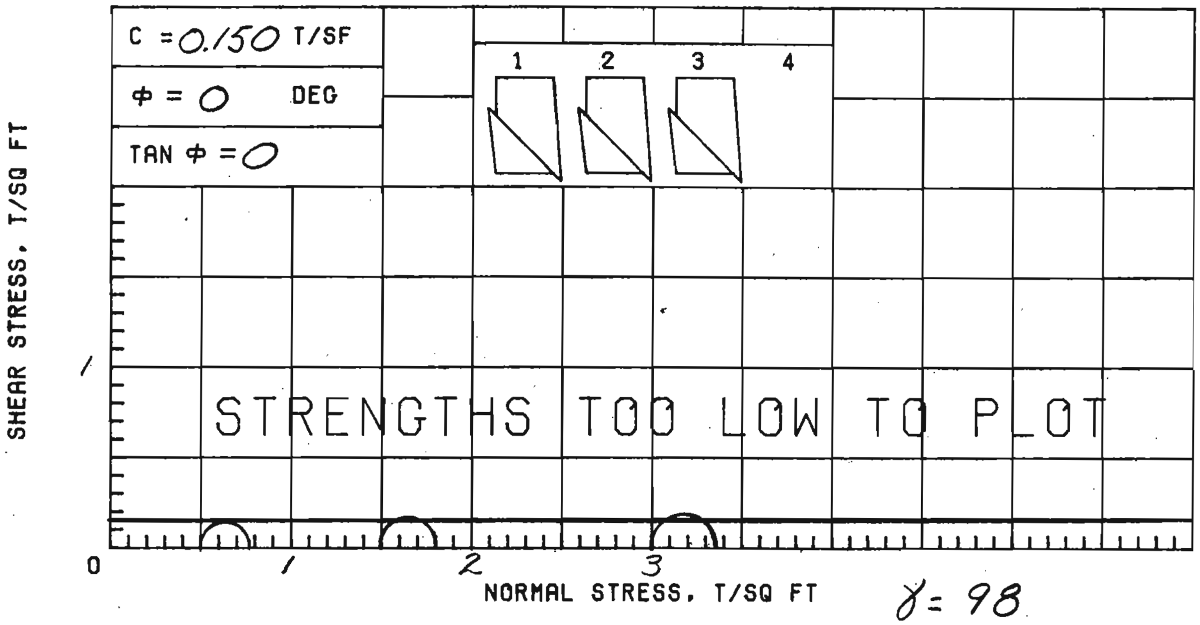
		△1	Y2	X3	Avg.
SPECIMEN NO.		△1	Y2	X3	Avg.
INITIAL	WATER CONTENT, %	83.0	83.3	83.0	83.1
INITIAL	DRY DENSITY, PCF	51.7	51.8	51.7	
INITIAL	SATURATION, %	99.2	99.7	99.2	
INITIAL	VOID RATIO	2.260	2.257	2.260	
BEFORE SHEAR	WATER CONTENT, %				
BEFORE SHEAR	DRY DENSITY, PCF				
BEFORE SHEAR	SATURATION, %				
BEFORE SHEAR	VOID RATIO				
BEFORE SHEAR	BACK PRESS., TSF				
MIN PRIN. STRESS, TSF		0.5	1.5	3.0	
MAX. DEV. STRESS, TSF		0.31	0.30	0.30	
TIME TO FAILURE, MIN.		6	24	24	
RATE OF STRAIN INCR.,%			6	6	
INITIAL DIAMETER, IN.		1.39	1.39	1.39	
INITIAL HEIGHT, IN.		3.00	3.00	3.00	

CONTROLLED-STRAIN TEST

DESCRIPTION OF SPECIMENS: PLASTIC CLAY (CH), GRAY

LL 94	PL 25	PI 69	GS 2.70 (ESTIMATED)	UNDISTURBED SPECIMEN	Q TEST

REMARKS:	PROJECT LAKE PONT. LA. & VIC. HURR. PROT	
	ORLEANS PARISH OUTFALL CANALS	
	BORING NO. 6-OUG	SAMPLE NO. 6-B
	DEPTH/ELEV 21.5/-23.0	TECH. KOC
	LABORATORY USAE WES	DATE 09 JAN 86
	TRIAXIAL COMPRESSION TEST REPORT	



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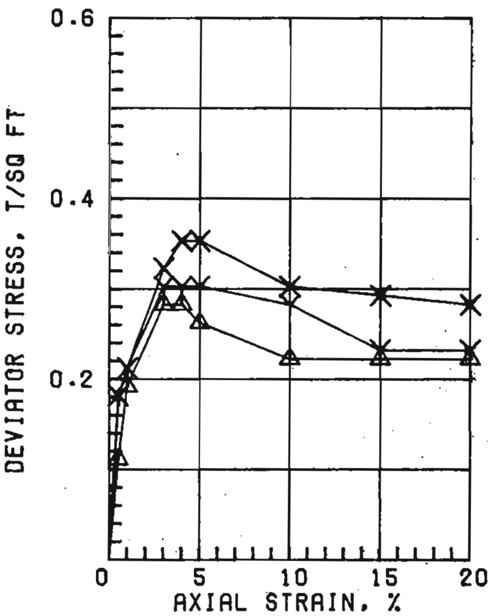


		Δ1	Y2	X3	Avg.
SPECIMEN NO.		Δ1	Y2	X3	Avg.
INITIAL	WATER CONTENT, %	70.5	74.9	67.1	70.8
INITIAL	DRY DENSITY, PCF	57.4	55.2	58.0	
INITIAL	SATURATION, %	98.3	98.5	95.1	
INITIAL	VOID RATIO	1.937	2.053	1.904	
BEFORE SHEAR	WATER CONTENT, %				
BEFORE SHEAR	DRY DENSITY, PCF				
BEFORE SHEAR	SATURATION, %				
BEFORE SHEAR	VOID RATIO				
BEFORE SHEAR	BACK PRESS., TSF				
MIN PRIN. STRESS, TSF		0.5	1.5	3.0	
MAX. DEV. STRESS, TSF		0.28	0.30	0.35	
TIME TO FAILURE, MIN.		6	18	24	
RATE OF STRAIN INCR.%			6	6	
INITIAL DIAMETER, IN.		1.39	1.39	1.39	
INITIAL HEIGHT, IN.		3.00	3.00	3.00	

CONTROLLED-STRAIN TEST

DESCRIPTION OF SPECIMENS: PLASTIC CLAY (CH), GRAY; SILT POCKETS

LL 84	PL 22	PI 62	GS 2.70 (ESTIMATED)	UNDISTURBED SPECIMEN	Q TEST

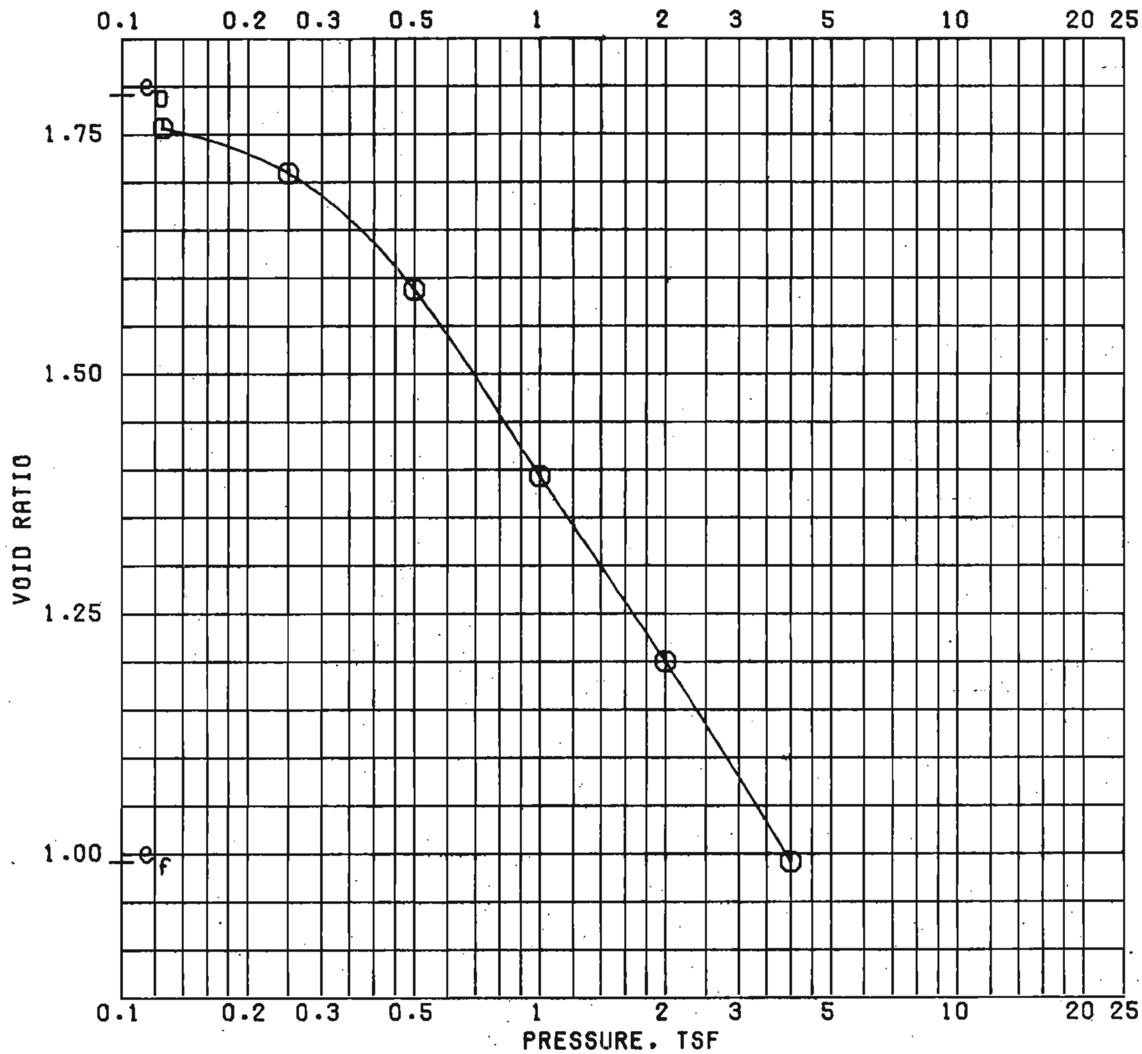
REMARKS:

PROJECT LAKE PONT. LA. & VIC. HURR. PROT

ORLEANS PARISH OUTFALL CANALS

BORING NO. 6-OUG	SAMPLE NO. 7-B
DEPTH/ELEV 25.7/-27.2	TECH. KOC
LABORATORY USAE WES	DATE 26 NOV 85

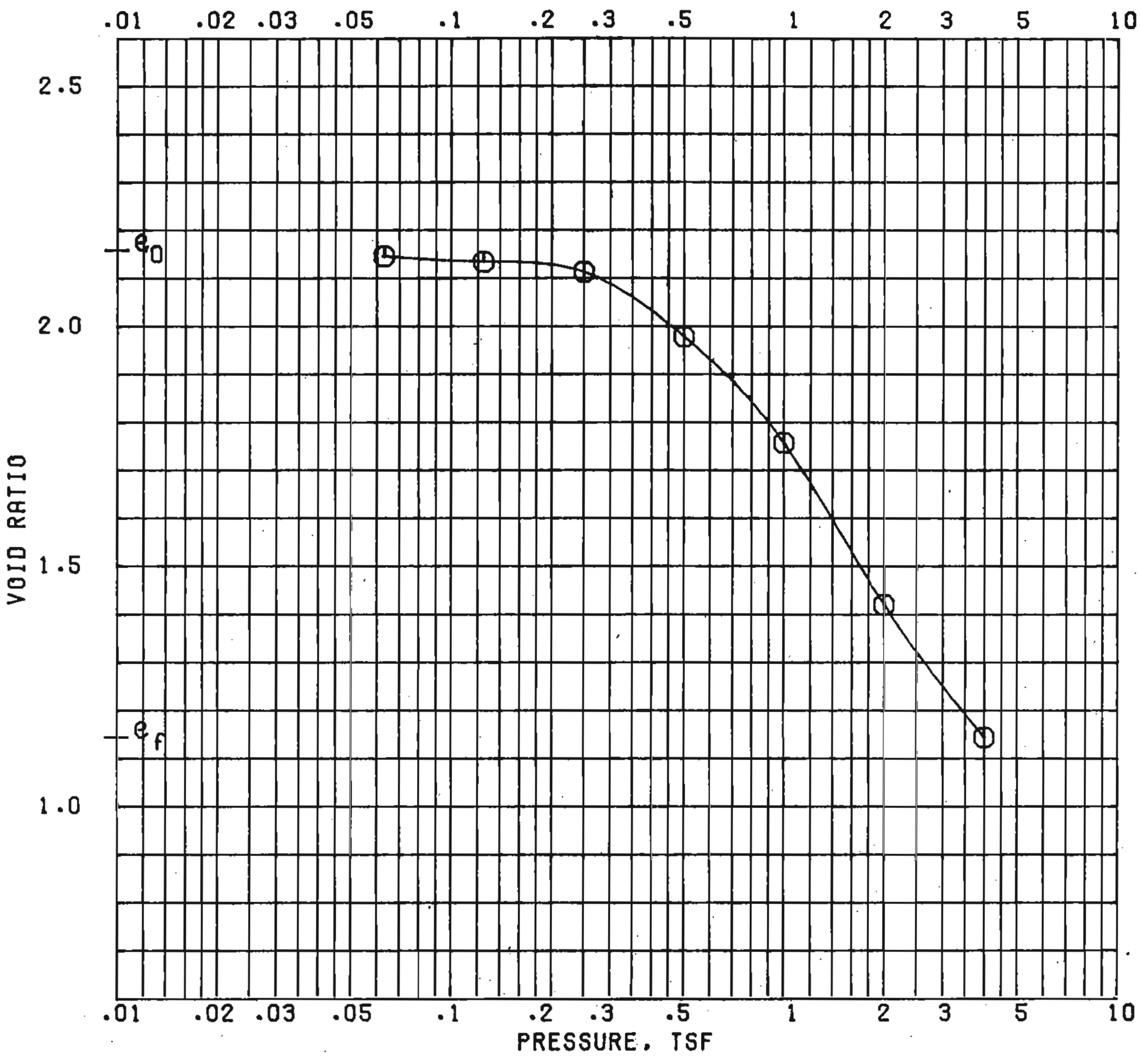
TRIAXIAL COMPRESSION TEST REPORT



			BEFORE TEST	AFTER TEST
OVERBURDEN PRESSURE, TSF		WATER CONTENT, %	61.6	38.3
PRECONSOL. PRESSURE, TSF	0.37	DRY DENSITY, PCF	60.4	84.7
COMPRESSION INDEX		SATURATION, %	93.0	100 +
TYPE SPECIMEN	UNDISTURBED	VOID RATIO	1.790	0.990
DIA. IN 4.44	HT. IN 1.134	BACK PRESSURE, TSF		

CLASSIFICATION	PLASTIC CLAY (CH), GRAY
LL / PL / PI	PROJECT LAKE PONT LA & VIC HURR PROT
GS 2.70 (EST) / D_{10}	ORLEANS PARISH OUTFALL CANALS
REMARKS	BORING NO. 6-OUG / SAMPLE NO. 5-B
	DEPTH/ELEV 17.4/-18.9 / DATE 06 FEB 86
	CONSOLIDATION TEST REPORT

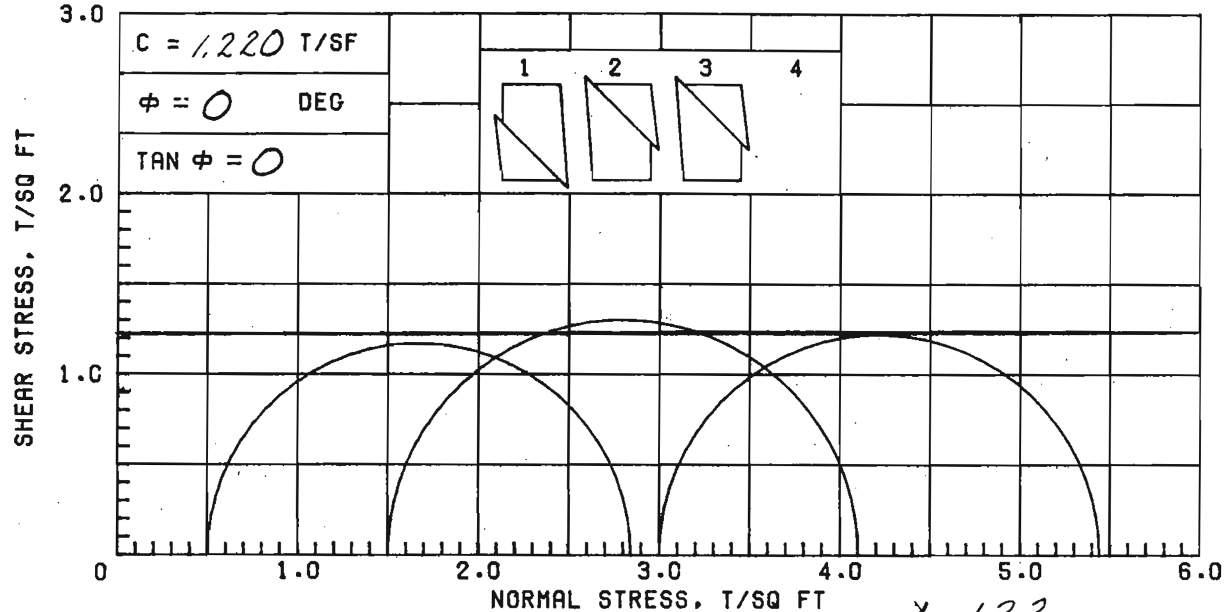
SHEET 1 OF 8



			BEFORE TEST	AFTER TEST
OVERBURDEN PRESSURE, TSF		WATER CONTENT, %	78.3	48.0
PRECONSOL. PRESSURE, TSF	0.46	DRY DENSITY, PCF	53.4	78.8
COMPRESSION INDEX		SATURATION, %	98.1	100 +
TYPE SPECIMEN	UNDISTURBED	VOID RATIO	2.155	1.140
DIA. IN 4.44	HT. IN 1.126	BACK PRESSURE, TSF		
CLASSIFICATION PLASTIC CLAY (CH), GRAY				
LL	PL	PI	PROJECT LAKE PONT LA & VIC HURR PROT	
GS 2.70 (EST)	D_{10}		ORLEANS PARISH OUTFALL CANALS	
REMARKS		BORING NO. 6-OUG	SAMPLE NO. 7-B	
		DEPTH/ELEV 25.5/-27.0	DATE 05 FEB 86	

CONSOLIDATION TEST REPORT

SHEET 1 OF 8



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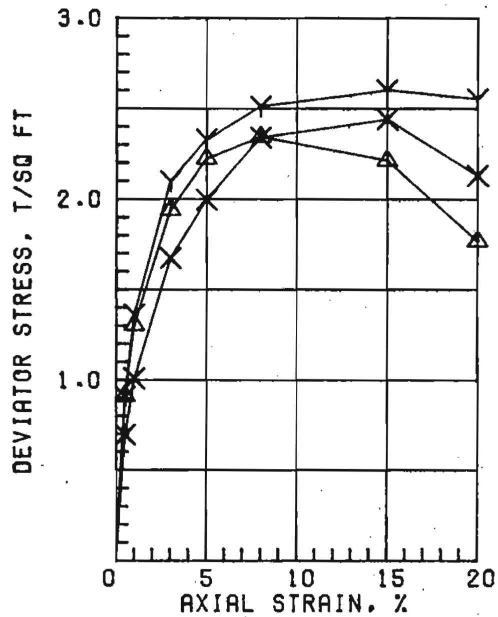


	SPECIMEN NO.	△1	Y2	X3	Avg.
INITIAL	WATER CONTENT, %	28.4	28.6	28.9	28.6
	DRY DENSITY, PCF	94.0	95.9	94.4	
	SATURATION, %	96.7	100+	99.4	
	VOID RATIO	0.793	0.757	0.785	
BEFORE SHEAR	WATER CONTENT, %				
	DRY DENSITY, PCF				
	SATURATION, %				
	VOID RATIO				
	BACK PRESS., TSF				
MIN PRIN. STRESS, TSF		0.5	1.5	3.0	
MAX. DEV. STRESS, TSF		2.34	2.60	2.44	
TIME TO FAILURE, MIN.		16	30	30	
RATE OF STRAIN INCR.,%					
INITIAL DIAMETER, IN.		1.39	1.39	1.39	
INITIAL HEIGHT, IN.		3.00	3.00	3.00	

CONTROLLED-STRAIN TEST

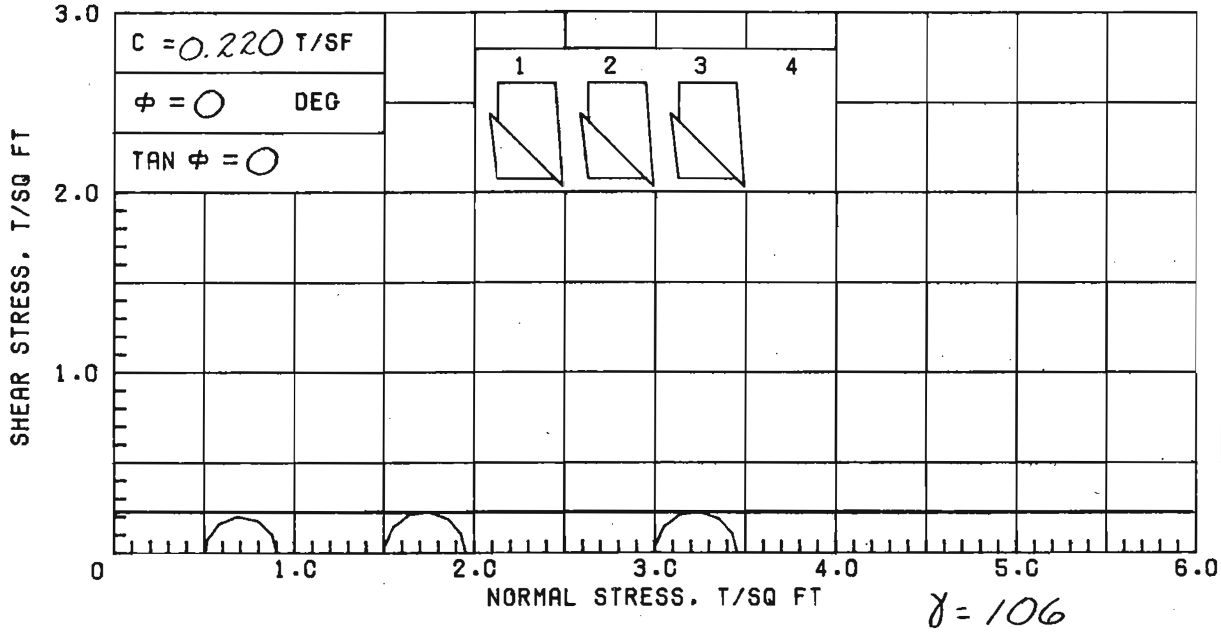
DESCRIPTION OF SPECIMENS: PLASTIC CLAY (CH), GRAY & BROWN MOTTLED

LL 61	PL 19	PI 42	GS 2.70 (ESTIMATED)	UNDISTURBED SPECIMEN	Q TEST

REMARKS:

PROJECT LAKE PONT. LA. & VIC. HURR. PROT ORLEANS PARISH OUTFALL CANALS	
BORING NO. 7-OUG	SAMPLE NO. 2-C
DEPTH/ELEV 7.0/+2.4	TECH. KOC
LABORATORY USAE WES	DATE 10 JAN 86

TRIAXIAL COMPRESSION TEST REPORT



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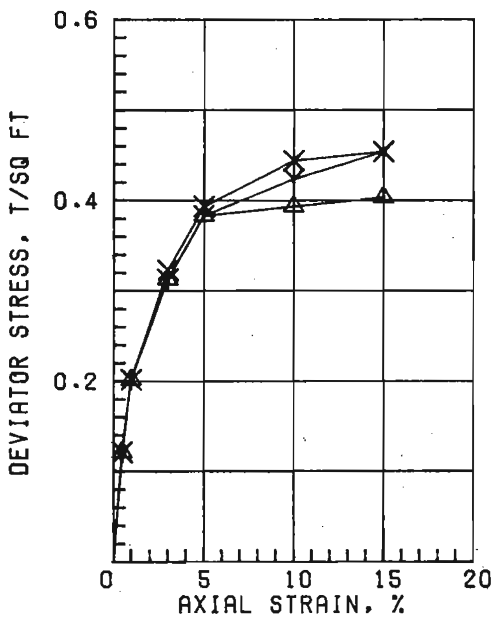


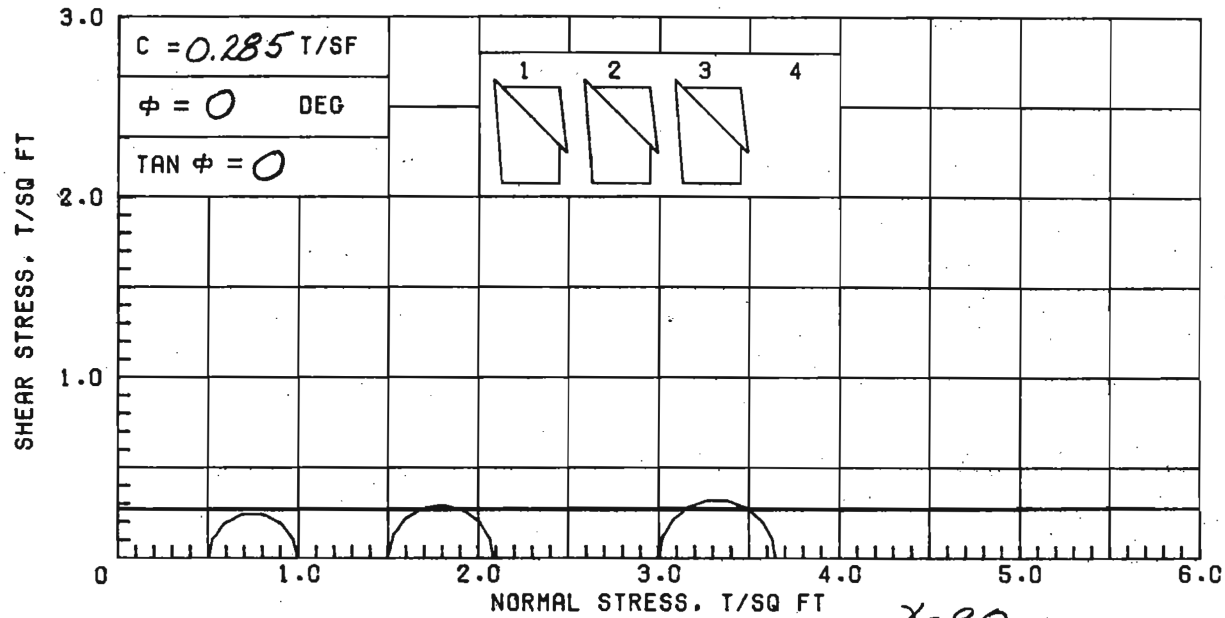
SPECIMEN NO.		△1	Y2	X3	Avg.
INITIAL	WATER CONTENT, %	46.4	47.1	46.9	46.8
	DRY DENSITY, PCF	70.3	70.0	69.3	
	SATURATION, %	89.6	90.4	88.4	
	VOID RATIO	1.398	1.407	1.433	
BEFORE SHEAR	WATER CONTENT, %				
	DRY DENSITY, PCF				
	SATURATION, %				
	VOID RATIO				
	BACK PRESS., TSF				
MIN PRIN. STRESS, TSF		0.5	1.5	3.0	
MAX. DEV. STRESS, TSF		0.40	0.45	0.45	
TIME TO FAILURE, MIN.		30	30	30	
RATE OF STRAIN INCR.,%					
INITIAL DIAMETER, IN.		1.39	1.39	1.39	
INITIAL HEIGHT, IN.		3.00	3.00	3.00	

CONTROLLED-STRAIN TEST

DESCRIPTION OF SPECIMENS: PLASTIC CLAY (CH), DARK GRAY

LL 59	PL 26	PI 33	GS 2.70 (ESTIMATED)	UNDISTURBED SPECIMEN	Q TEST

REMARKS;	PROJECT LAKE PONT. LA. & VIC. HURR. PROT	
	ORLEANS PARISH OUTFALL CANALS	
	BORING NO. 7-OUG	SAMPLE NO. 4-B
	DEPTH/ELEV 13.6/-4.2	TECH. KOC
	LABORATORY USAE WES	DATE 13 JAN 86
	TRIAXIAL COMPRESSION TEST REPORT	



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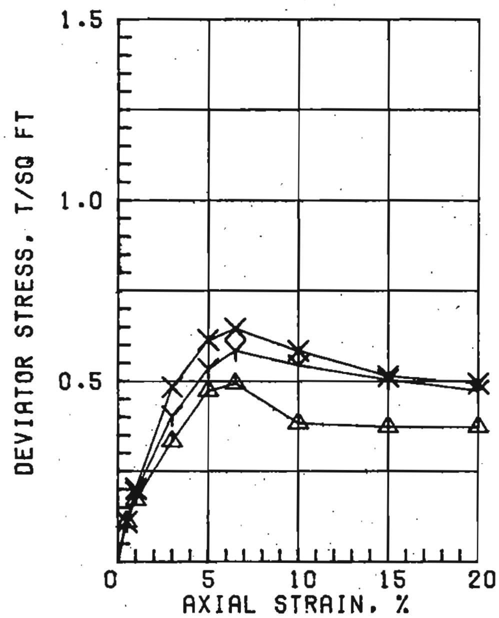


		Δ1	Y2	X3	Avg.
SPECIMEN NO.		Δ1	Y2	X3	Avg.
INITIAL	WATER CONTENT, %	101.0	95.4	100.2	95.5
INITIAL	DRY DENSITY, PCF	42.8	45.0	43.6	
INITIAL	SATURATION, %	92.9	93.7	94.4	
INITIAL	VOID RATIO	2.935	2.750	2.866	
BEFORE SHEAR	WATER CONTENT, %				
BEFORE SHEAR	DRY DENSITY, PCF				
BEFORE SHEAR	SATURATION, %				
BEFORE SHEAR	VOID RATIO				
BEFORE SHEAR	BACK PRESS., TSF				
MIN PRIN. STRESS, TSF		0.5	1.5	3.0	
MAX. DEV. STRESS, TSF		0.49	0.58	0.64	
TIME TO FAILURE, MIN.		13	13	13	
RATE OF STRAIN INCR.%					
INITIAL DIAMETER, IN.		1.39	1.39	1.39	
INITIAL HEIGHT, IN.		3.00	3.00	3.00	

CONTROLLED-STRAIN TEST

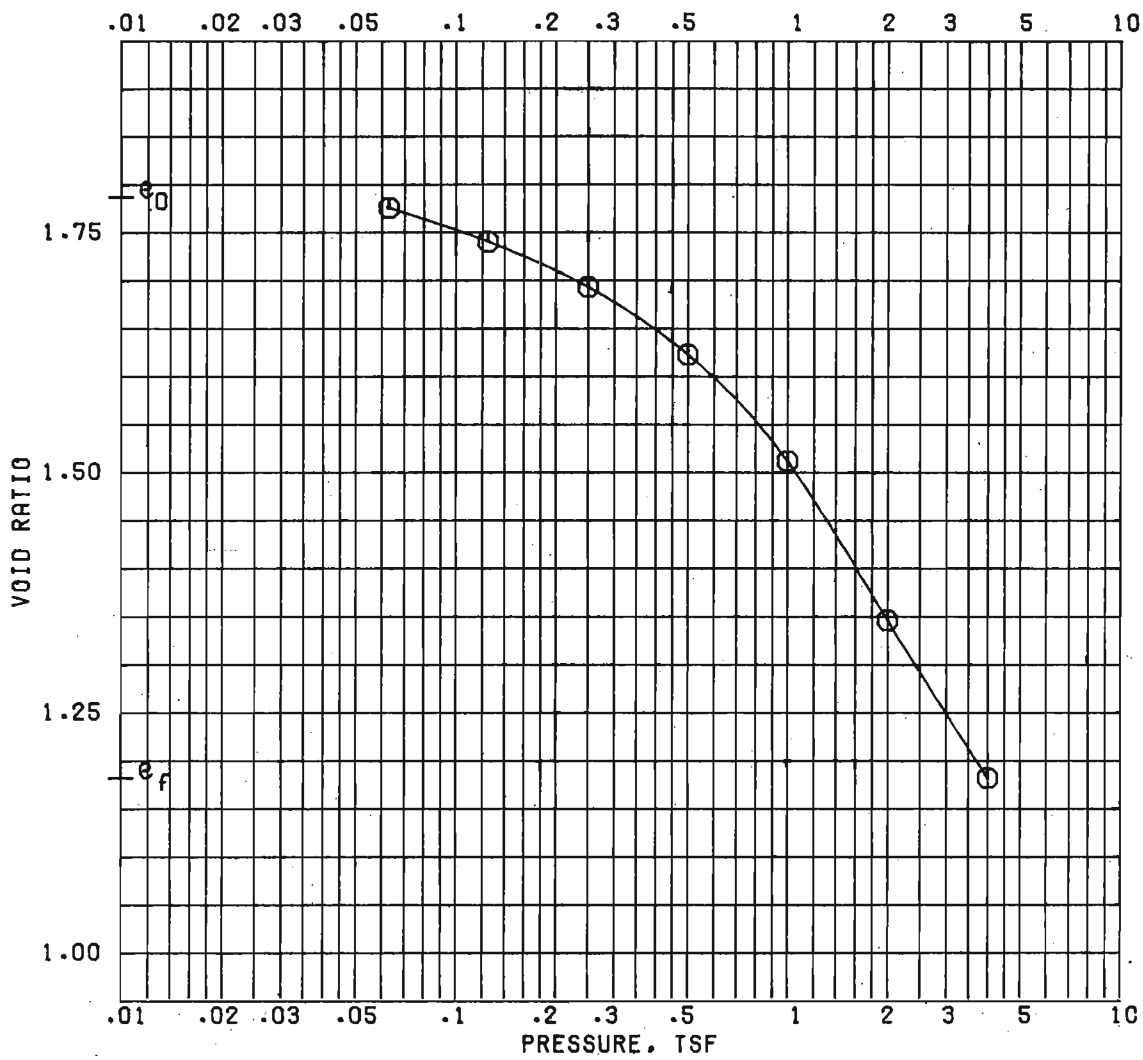
DESCRIPTION OF SPECIMENS: PLASTIC CLAY (CH), GRAY; ROOTS TO 1/4"

LL 106	PL 31	PI 75	GS 2.70 (ESTIMATED)	UNDISTURBED SPECIMEN	Q TEST

REMARKS:

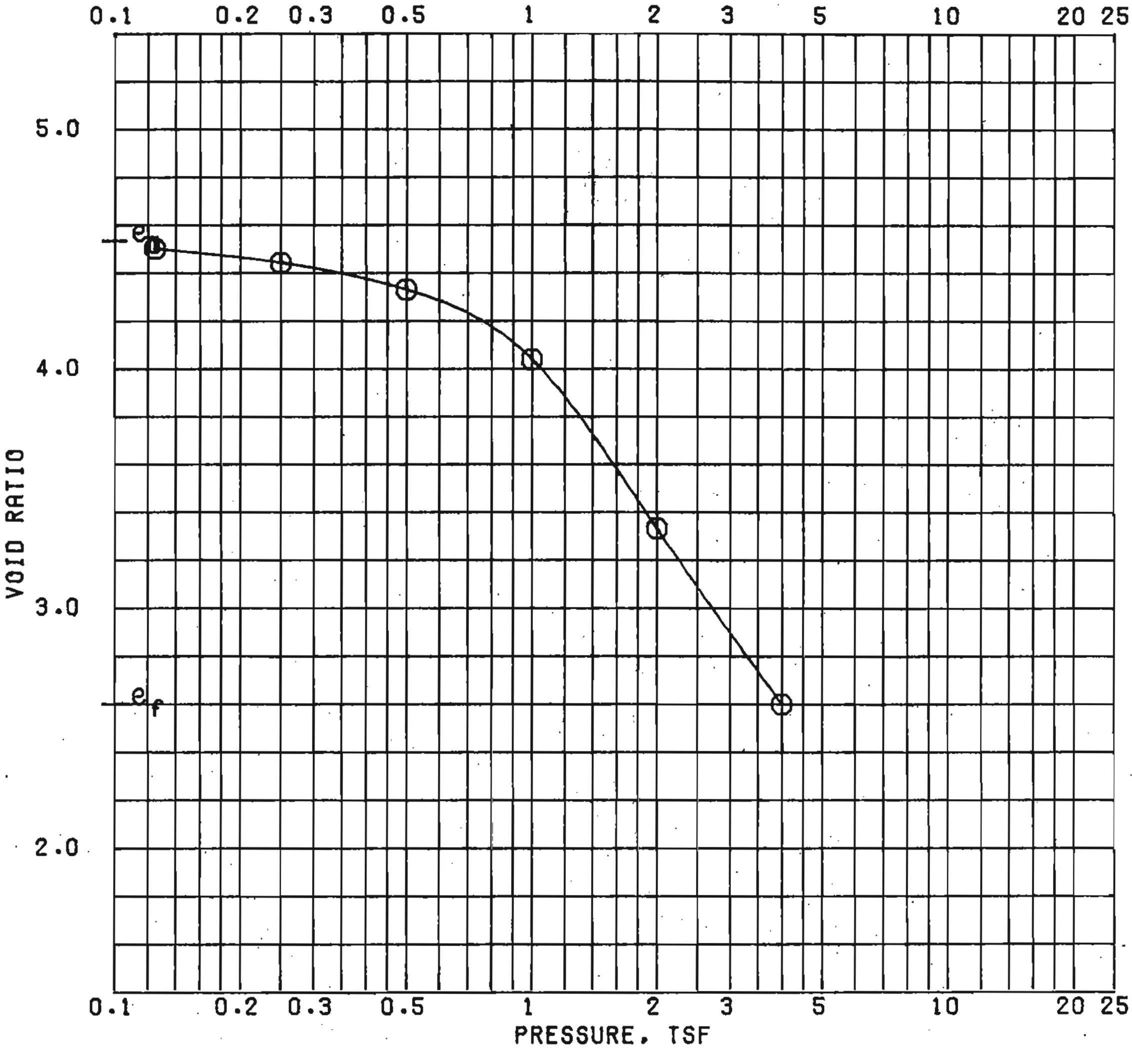
PROJECT	LAKE PONT. LA. & VIC. HURR. PROT ORLEANS PARISH OUTFALL CANALS
BORING NO. 7-OUG	SAMPLE NO. 6-B
DEPTH/ELEV 21.7/-12.3	TECH. KOC
LABORATORY USAE WES	DATE 13 JAN 86

TRIAXIAL COMPRESSION TEST REPORT



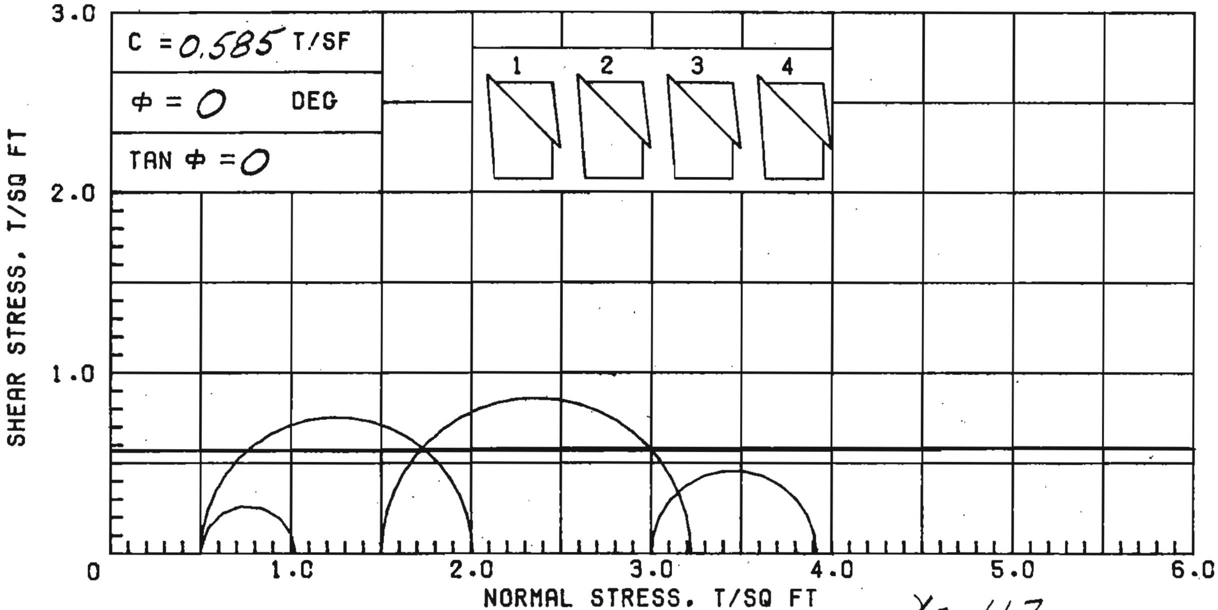
				BEFORE TEST	AFTER TEST
OVERBURDEN PRESSURE, TSF			WATER CONTENT, %	59.2	41.2
PRECONSOL. PRESSURE, TSF		.59	DRY DENSITY, PCF	60.5	77.3
COMPRESSION INDEX			SATURATION, %	89.5	94.2
TYPE SPECIMEN	UNDISTURBED		VOID RATIO	1.786	1.180
DIA. IN 4.44	HT. IN 1.140		BACK PRESSURE, TSF		
CLASSIFICATION PLASTIC CLAY (CH), DARK GRAY					
LL	PL	PI	PROJECT LAKE PONT LA & VIC HURR PROT		
GS 2.70 (EST)	D_{10}		ORLEANS PARISH OUTFALL CANALS		
REMARKS			BORING NO. 7-OUG	SAMPLE NO. 4-B	
			DEPTH/ELEV 13.4/-4.0	DATE 07 FEB 86	
			CONSOLIDATION TEST REPORT		

SHEET 1 OF 8



			BEFORE TEST	AFTER TEST
OVERBURDEN PRESSURE, TSF		WATER CONTENT, %	153.2	91.0
PRECONSOL. PRESSURE, TSF	.85	DRY DENSITY, PCF	30.5	46.9
COMPRESSION INDEX		SATURATION, %	91.4	94.8
TYPE SPECIMEN	UNDISTURBED	VOID RATIO	4.527	2.592
DIA. IN 4.44	HT. IN 1.125	BACK PRESSURE, TSF		
CLASSIFICATION	PLASTIC CLAY (CH), DARK BROWN			
LL	PL	PI	PROJECT LAKE PONT LA & VIC HURR PROT	
GS 2.70 (EST)	D_{10}		ORLEANS PARISH OUTFALL CANALS	
REMARKS			BORING NO. 7-OUG	SAMPLE NO. 6-B
			DEPTH/ELEV 21.5/-12.1	DATE 06 FEB 86
			CONSOLIDATION TEST REPORT	

SHEET 1 OF 8



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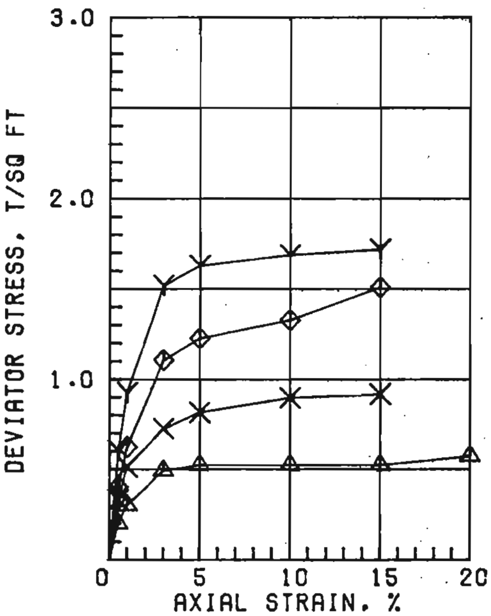


	SPECIMEN NO.	△1	Y2	X3	◇4	
INITIAL	WATER CONTENT, %	35.2	26.8	32.2	33.2	Avg. 31.9
INITIAL	DRY DENSITY, PCF	82.7	89.3	83.9	90.4	
INITIAL	SATURATION, %	91.5	81.6	86.1	100+	
INITIAL	VOID RATIO	1.038	0.887	1.009	0.864	
BEFORE SHEAR	WATER CONTENT, %					
BEFORE SHEAR	DRY DENSITY, PCF					
BEFORE SHEAR	SATURATION, %					
BEFORE SHEAR	VOID RATIO					
BEFORE SHEAR	BACK PRESS., TSF					
	MIN PRIN. STRESS, TSF	0.5	1.5	3.0	0.5	
	MAX. DEV. STRESS, TSF	0.52	1.72	0.92	1.51	
	TIME TO FAILURE, MIN.	10	30	30	30	
	RATE OF STRAIN INCR.,%					
	INITIAL DIAMETER, IN.	1.40	1.40	1.39	1.40	
	INITIAL HEIGHT, IN.	3.00	3.00	3.00	3.00	

CONTROLLED-STRAIN TEST

DESCRIPTION OF SPECIMENS: CLAY (CL), BROWN; SILT POCKETS

LL 43	PL 15	PI 28	GS 2.70 (ESTIMATED)	UNDISTURBED SPECIMEN	Q TEST

REMARKS:

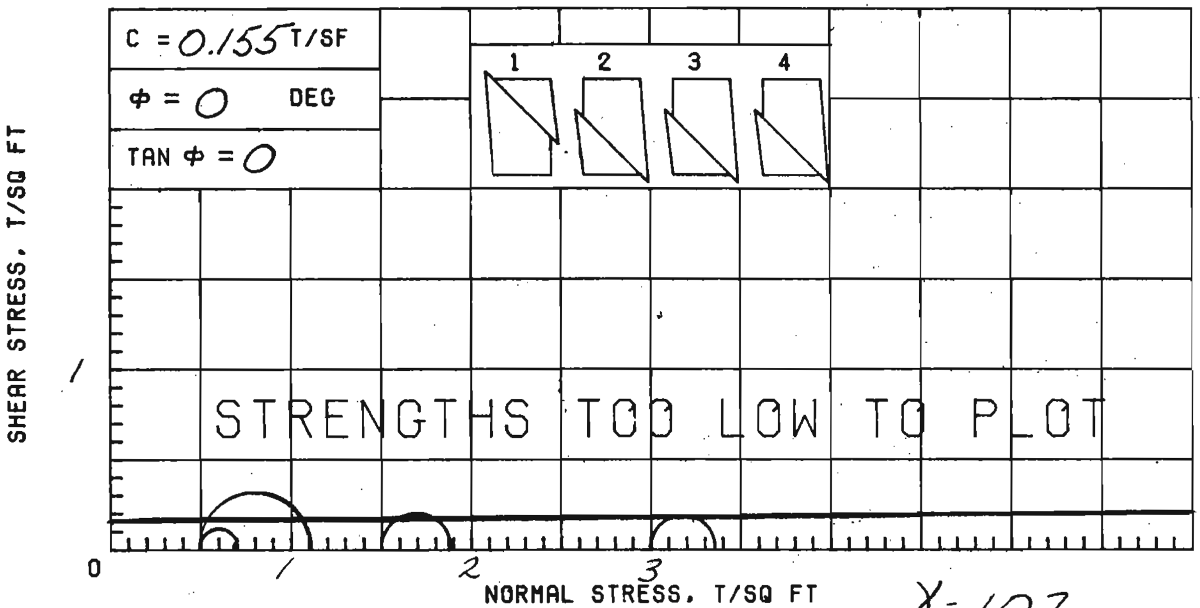
PROJECT LAKE PONT. LA. & VIC. HURR. PROT ORLEANS PARISH OUTFALL CANALS	
BORING NO. 8-OUG	SAMPLE NO. 1-C
DEPTH/ELEV 2.1/+3.7	TECH. KOC
LABORATORY USAE WES	DATE 14 JAN 86

TRIAXIAL COMPRESSION TEST REPORT

C = 0.155 T/SF

Φ = 0 DEG

TAN Φ = 0



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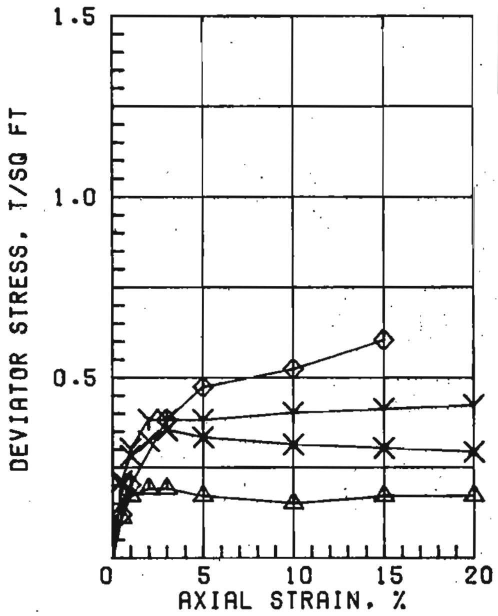

SPECIMEN NO.		△1	Y2	X3	◇4
INITIAL	WATER CONTENT, %	50.3	41.3	72.5	36.5
	DRY DENSITY, PCF	69.9	78.3	56.6	80.0
	SATURATION, %	96.2	96.7	98.8	89.1
	VOID RATIO	1.411	1.153	1.980	1.106
BEFORE SHEAR	WATER CONTENT, %				
	DRY DENSITY, PCF				
	SATURATION, %				
	VOID RATIO				
	BACK PRESS., TSF				
MIN PRIN. STRESS, TSF		0.5	1.5	3.0	0.5
MAX. DEV. STRESS, TSF		0.19	0.38	0.35	0.60
TIME TO FAILURE, MIN.		4	12	6	30
RATE OF STRAIN INCR.%			6		
INITIAL DIAMETER, IN.		1.39	1.39	1.39	1.39
INITIAL HEIGHT, IN.		3.00	3.00	3.00	3.00

Avg. 50.2

CONTROLLED-STRAIN TEST

DESCRIPTION OF SPECIMENS: PLASTIC CLAY (CH), GRAY; SHELLS; ORGANIC MATERIAL

LL 70	PL 19	PI 51	GS 2.70 (ESTIMATED)	UNDISTURBED SPECIMEN	Q TEST

REMARKS:

PROJECT LAKE PONT. LA. & VIC. HURR. PROT ORLEANS PARISH OUTFALL CANALS	
BORING NO. 8-OUG	SAMPLE NO. 2-C
DEPTH/ELEV 6.6/-0.8	TECH. KOC
LABORATORY USAE WES	DATE 14 JAN 86

TRIAXIAL COMPRESSION TEST REPORT

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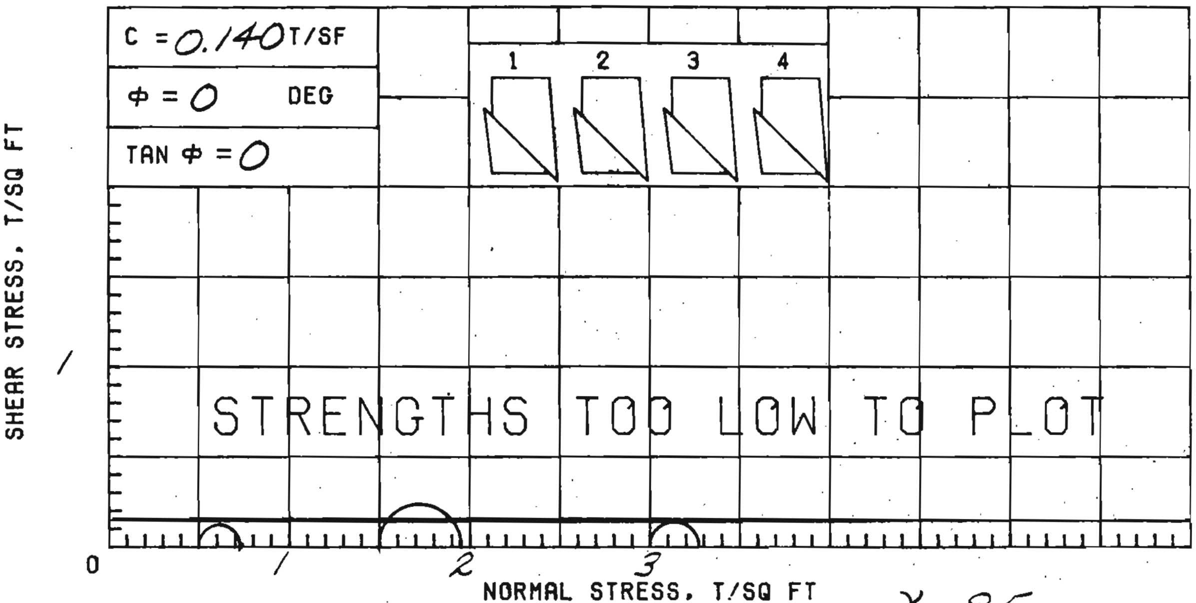
Φ = 0 DEG
TAN Φ = 0



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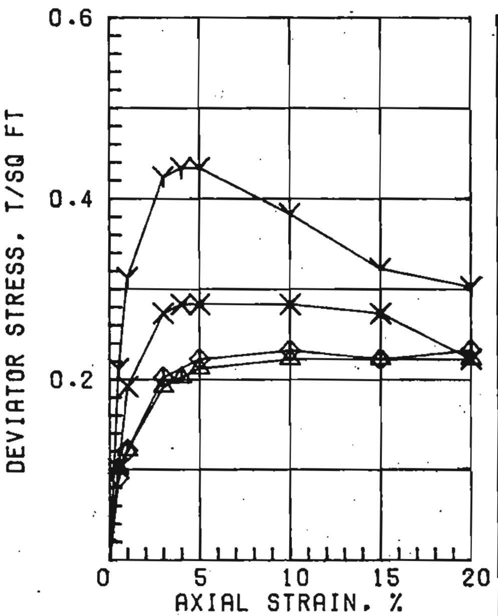


	SPECIMEN NO.	△1	Y2	X3	◇4	
INITIAL	WATER CONTENT, %	121.0	100.0	153.3	152.0	Avg. 131.6
	DRY DENSITY, PCF	37.0	44.6	30.0	30.6	
	SATURATION, %	92.0	97.1	89.6	91.1	
	VOID RATIO	3.550	2.781	4.619	4.504	
BEFORE SHEAR	WATER CONTENT, %					
	DRY DENSITY, PCF					
	SATURATION, %					
	VOID RATIO					
	BACK PRESS., TSF					
	MIN PRIN. STRESS, TSF	0.5	1.5	3.0	0.5	
	MAX. DEV. STRESS, TSF	0.22	0.43	0.28	0.23	
	TIME TO FAILURE, MIN.	20	8	8	20	
	RATE OF STRAIN INCR.,%					
	INITIAL DIAMETER, IN.	1.39	1.39	1.39	1.39	
	INITIAL HEIGHT, IN.	3.00	3.00	3.00	3.00	

CONTROLLED-STRAIN TEST

DESCRIPTION OF SPECIMENS: PLASTIC CLAY (CH), GRAY; DECAYED WOOD

LL 154	PL 38	PI 116	GS 2.70 (ESTIMATED)	UNDISTURBED SPECIMEN	Q TEST

REMARKS:	PROJECT LAKE PONT. LA. & VIC. HURR. PROT	
	ORLEANS PARISH OUTFALL CANALS	
	BORING NO. 8-OUG	SAMPLE NO. 4-B
	DEPTH/ELEV 13.8/-8.0	TECH. KOC
	LABORATORY USAE WES	DATE 15 JAN 86
	TRIAXIAL COMPRESSION TEST REPORT	

AE/COE PIEZOMETER READINGS

APPENDIX B-2

A-E PIEZOMETERS

ORLEANS AVE OUTFALL CANAL

	Piezometers, EL NGVD						Gages, EL. NGVD		
Date	P-1	P-2	P-3	P-4	P-5	P-6	West End @ 8:00 AM	Robt. E. Lee Blvd	Harrison Ave
9/27/85	-8.4	-8.2	-7.7	2.2	2.1	-0.6	1.81	—	—
9/30/85	-7.3	-7.2	-6.9	2.4	1.9	0.0	2.78	—	—
10/01/85	-6.8	-6.6	-6.0	2.5	2.1	0.3	2.68	—	—
*10/30/85	-4.8	-4.6	-4.3	4.7	3.9	2.0	5.42	—	—
4/23/86	-8.9	-8.7	-8.2	0.8	1.2	-6.3	—	0.91	0.95
5/07/86	-8.9	-8.8	-8.3	1.3	0.9	—	—	1.9	1.9
5/26/86	-9.1	-9.1	-8.7	1.2	0.8	—	—	1.2	1.3
6/02/86	-9.3	-8.6	-8.7	1.3	1.0	-.8	—	1.7	1.75
6/25/86	-8.5	-8.3	-7.8	1.3	1.0	-.7	—	1.6	1.62
7/16/86	-8.9	-8.7	-8.1	0.65	0.3	-1.0	—	0.98	1.18
8/06/86	-9.0	-8.8	-8.4	0.5	0.1	-1.4	—	0.98	0.85
8/20/86	-8.2	-8.0	-7.4	0.7	0.4	-1.0	—	0.60	0.60
9/16/86	-8.7	-8.6	-8.1	1.4	1.1	-.7	—	1.7	1.7
10/23/86	-8.9	-8.8	-8.3	1.8	1.3	-.6	—	2.3	2.3
12/10/86	-8.0	-7.8	-7.3	1.75	1.3	-.1	—	1.95	1.8

* Hurricane Juan influence on gage readings Oct 18 to Nov 3rd 1985

COE PIEZOMETERS

ORLEANS AVE OUTFALL CANAL

Date	1-E	2-E	3-E	4-E	5-E	1-W	2-W	3-W	4-W	5-W	Gage EL. NGVD
7/2/70	—	—	—	—	—	-9.3	-8.8	—	—	—	0.5
7/13/70	-8.45	-8.0	—	—	—	-7.5	-8.4	—	—	—	0.4
7/23/70	-7.3	-7.2	—	—	—	—	-7.55	—	—	—	1.15
9/15/70	-8.1	-8.0	—	—	—	-9.4	-8.3	—	—	—	2.0
9/9/71	-7.3	-7.95	-7.6	-7.8	-6.9	—	-8.2	-8.2	-8.1	-8.7	2.4

SAMPLE CALCULATIONS

APPENDIX B-3

COMPUTATION SHEET

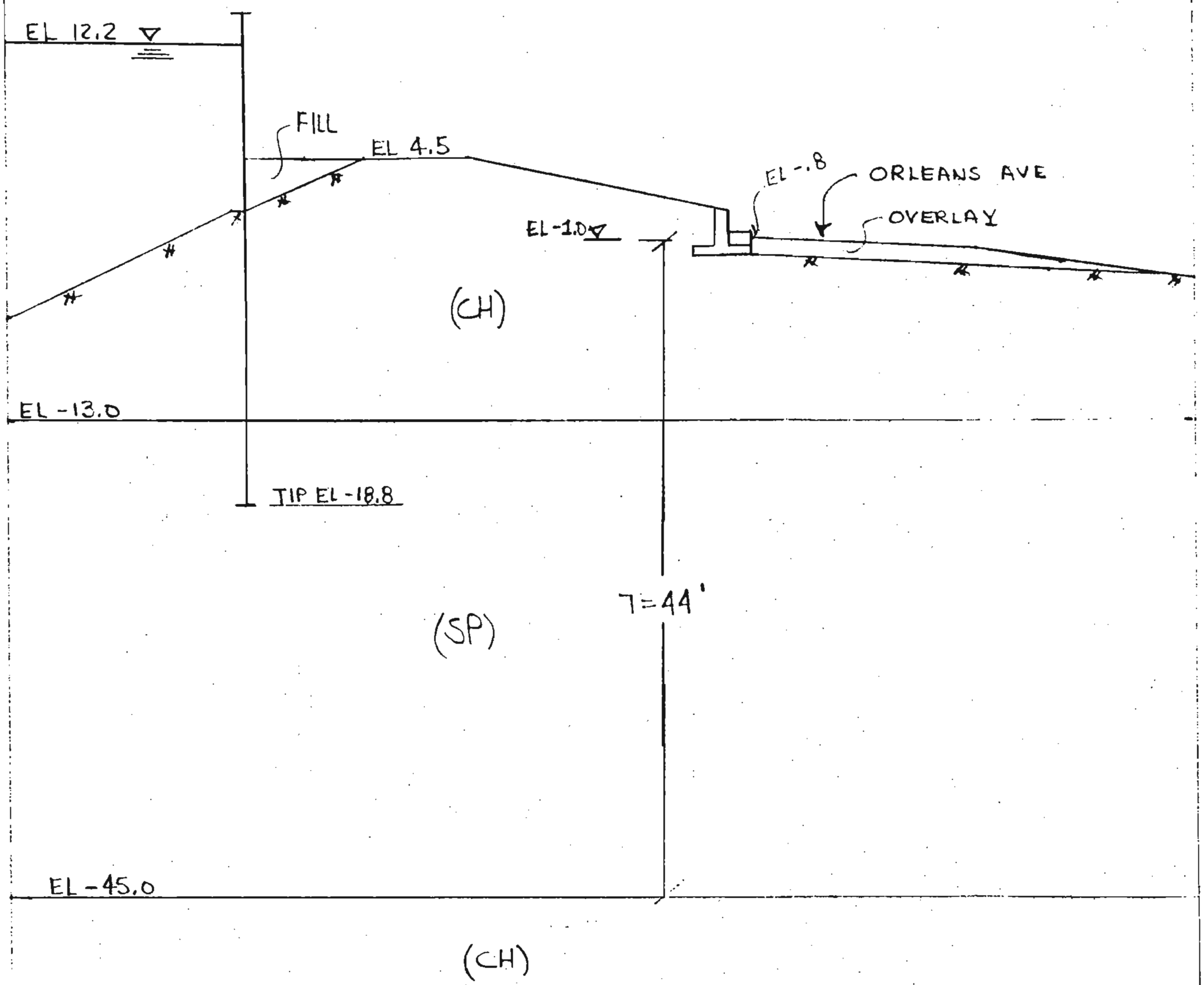
PROJECT ORLEANS AVE OUTFALL CANAL	PAGE 1 OF 1	COMPUTED BY FJV	DATE 5/88
SUBJECT UNDER SEEPAGE STA 2+44 TO 29+40 WEST SIDE		CHECKED BY	DATE

HARR METHOD

$S = 18'$ $T = 44$ $2h_m = 13.2$

$S/T = 18'/44' = .41$ $\frac{I_e S}{h_m} = .60 = \frac{I_e(18')}{6.6'}$ $I_e = .22$

$I_e = .22 < \begin{matrix} .34\ (CH) \\ .24\ (SP) \end{matrix} (OK)$



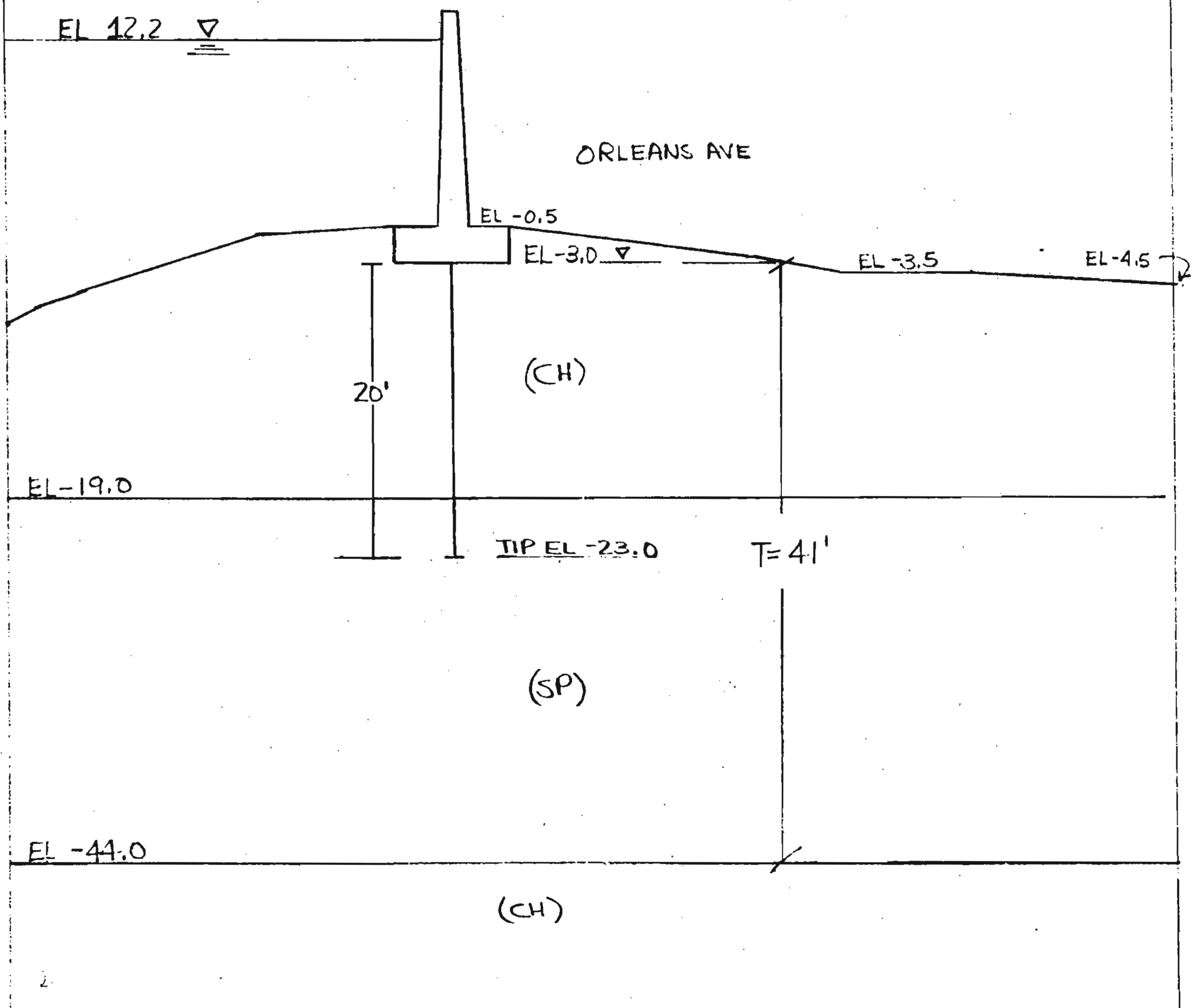
COMPUTATION SHEET

PROJECT ORLEANS AVE OUTFALL CANAL	PAGE 1 OF 1	COMPUTED BY FJV	DATE 5/85
SUBJECT UNDERSEEPAGE STA 29+40 TO 50+00 + STA 22+80 TO STA 23+40		CHECKED BY	DATE

HARR METHOD

$S = 20'$ $T = 41'$ $2h_m = 15.2'$

$S/T = 20'/41' = .49$ $\frac{I_e S}{h_m} = .585 = \frac{I_e(20')}{7.6'}$ $I_e = .22 < \begin{matrix} .34\ (CH) \\ .24\ (SP) \end{matrix}$ (OK)



COMPUTATION SHEET

PROJECT ORLEANS AVE OUTFALL CANAL	PAGE 1 OF 1	COMPUTED BY FJV	DATE 5/86
SUBJECT UNDERSEEPAGE STA 50+00 TO 64+00 HARR'S METHOD		CHECKED BY	DATE

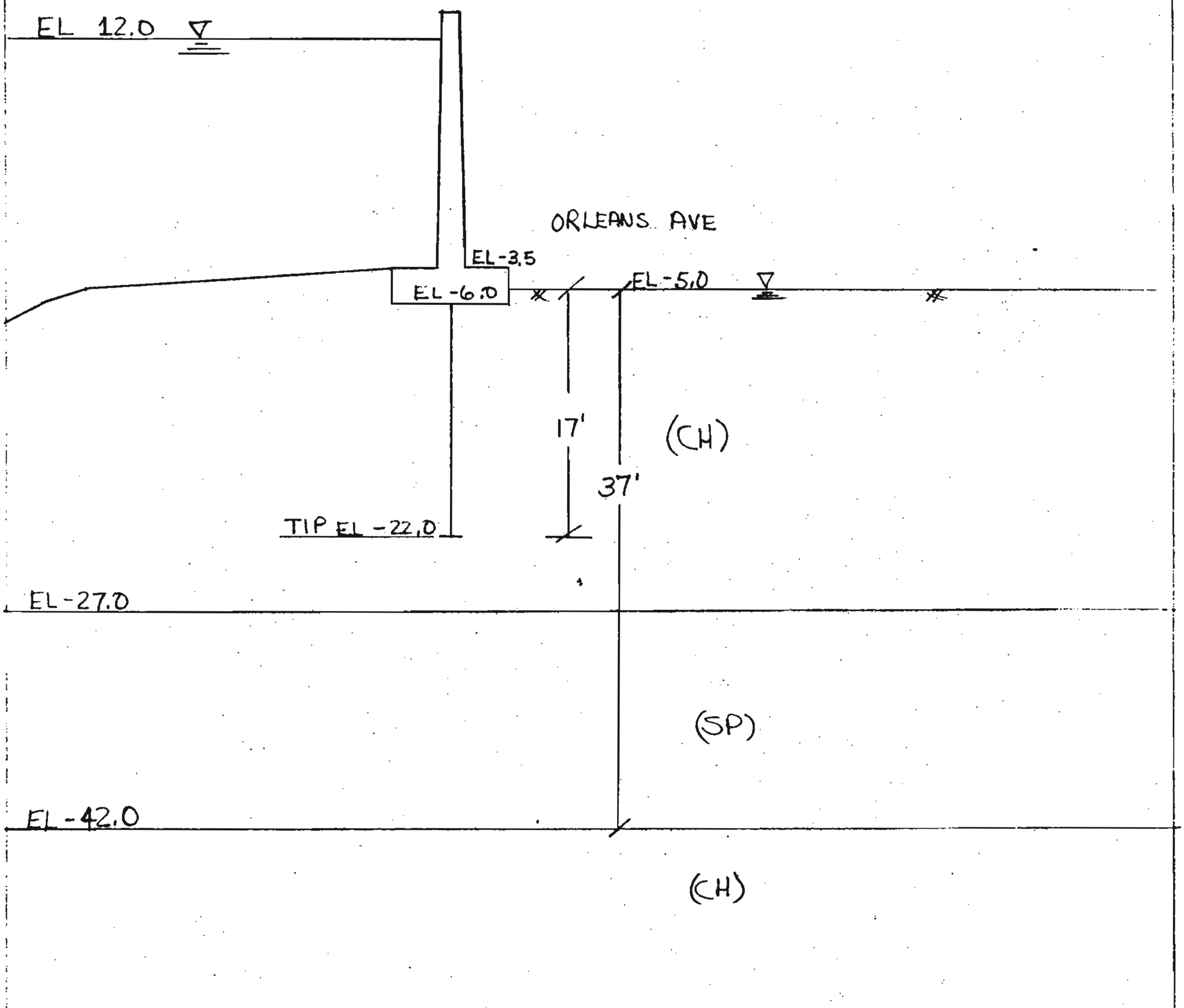
HARR'S METHOD

$S = 17.0'$ $T = 37'$ $2h_m = 17.0'$

$S/T = 17.0'/37' = .46$ $\dfrac{I_e S}{h_m} = .595 = \dfrac{I_e(17.0')}{8.5}$ $I_e = .30$

$I_{CR} = 37.5/62.5 = .6$

$F.S. = I_{CR}/I_e = .6/.3 = 2.0 \geq 2.0$ (CH) (OK)



COMPUTATION SHEET

PROJECT ORLEANS AVE OUTFALL CANAL	PAGE 1 OF 1	COMPUTED BY FJV	DATE 5/88
SUBJECT UNDERSEEPAGE STA 64+00 TO STA 90+50		CHECKED BY	DATE

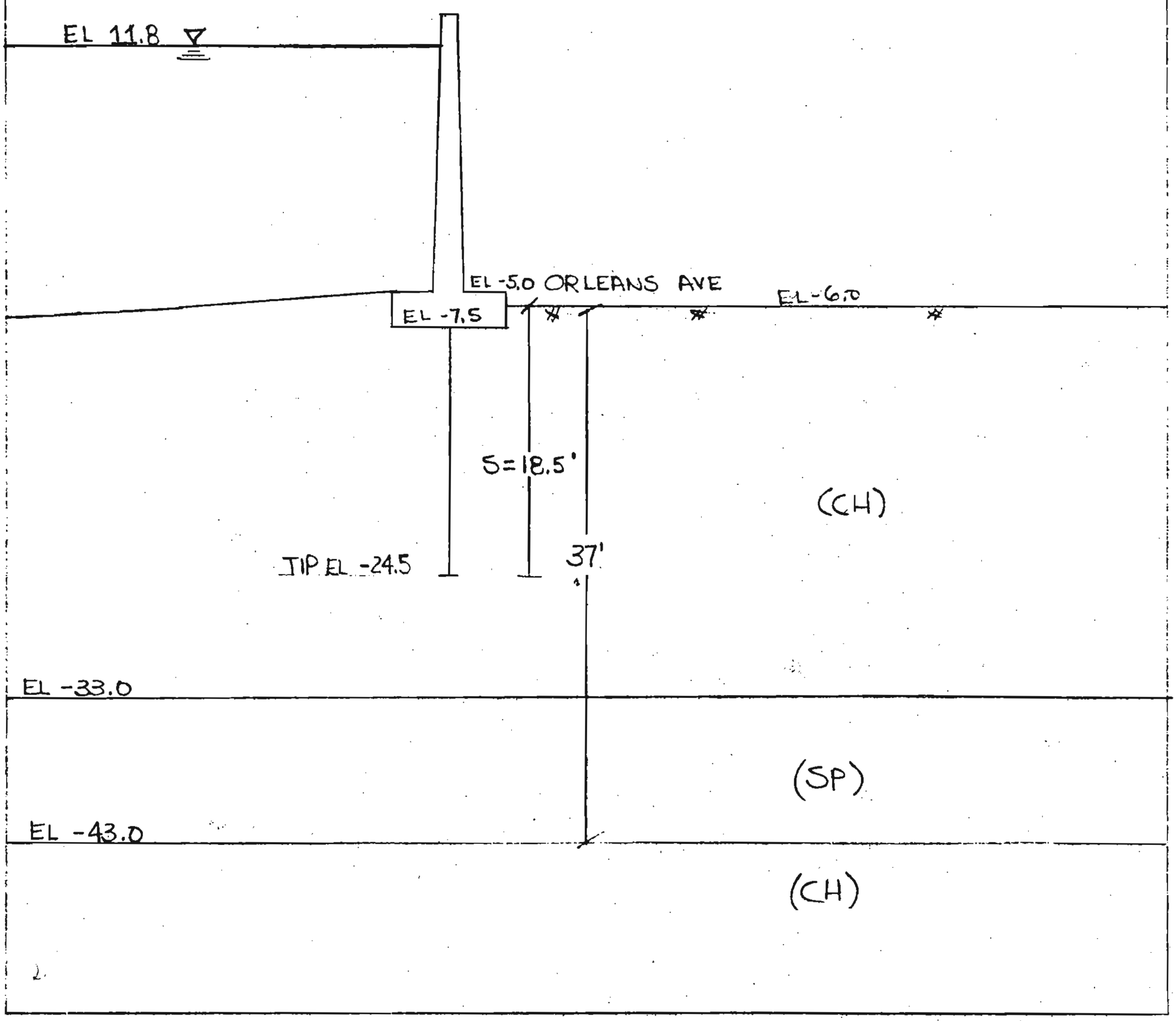
HARR METHOD

$S = 18.5 \quad T = 37' \quad 2h_m = 17.8$

$S/T = 18.5'/37' = .5 \qquad \frac{I_e S}{h_m} = .59 = \frac{I_e(18.5)}{8.9} \qquad I_e = .280$

$I_{CR} = 37.5\text{pcf}/62.5\text{pcf} = .6$

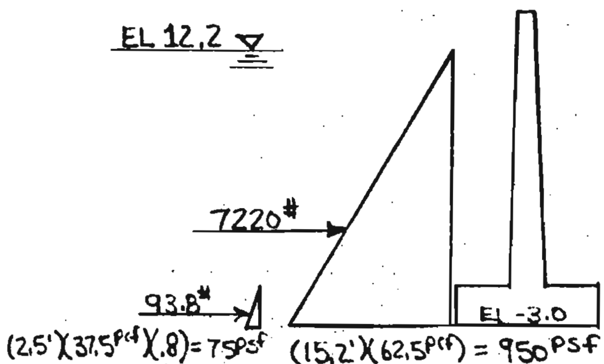
$F.S. = \frac{I_{CR}}{I_{ce}} = .6/.28 = 2.1 \geq 2.0$ (OK) (CH)



PROJECT ORLEANS AVE OUTFALL CANAL	PAGE 1 OF 2	COMPUTED BY FJV	DATE 5/88
SUBJECT LATERAL EARTH PRESSURE T-WALLS		CHECKED BY	DATE

STA 22+80 TO STA 23+40

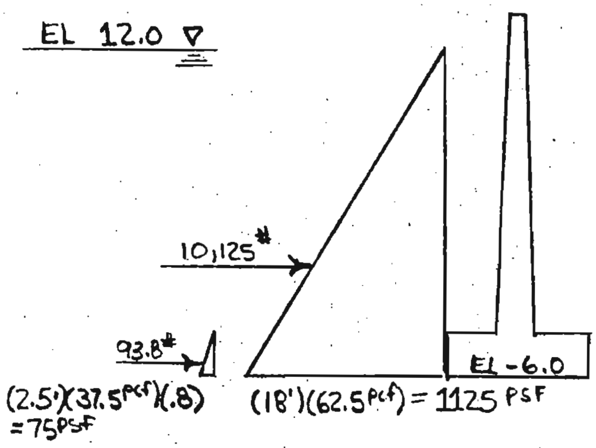
STA 29+40 TO STA 50+00



K_o Clay

At Rest Force = 7220# + 93.8# = 7314#

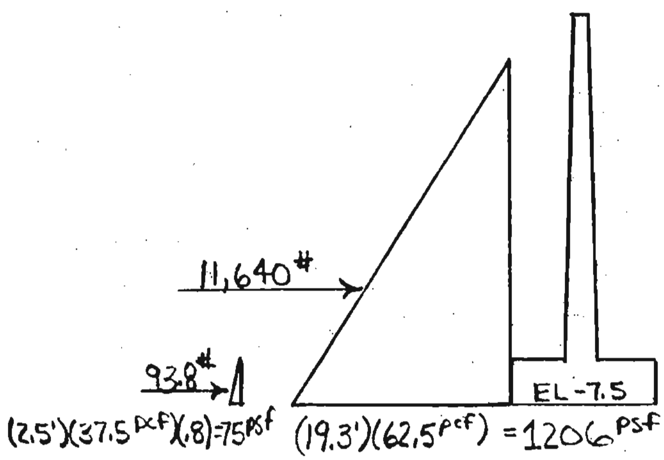
Sta 50+00 TO STA 64+00



At Rest Force = 10,125# + 93.8# = 10,219#

PROJECT ORLEANS AVE OUTFALL CANAL	PAGE 2 OF 2	COMPUTED BY FJV	DATE 5/88
SUBJECT LATERAL EARTH PRESSURE T-WALLS		CHECKED BY	DATE

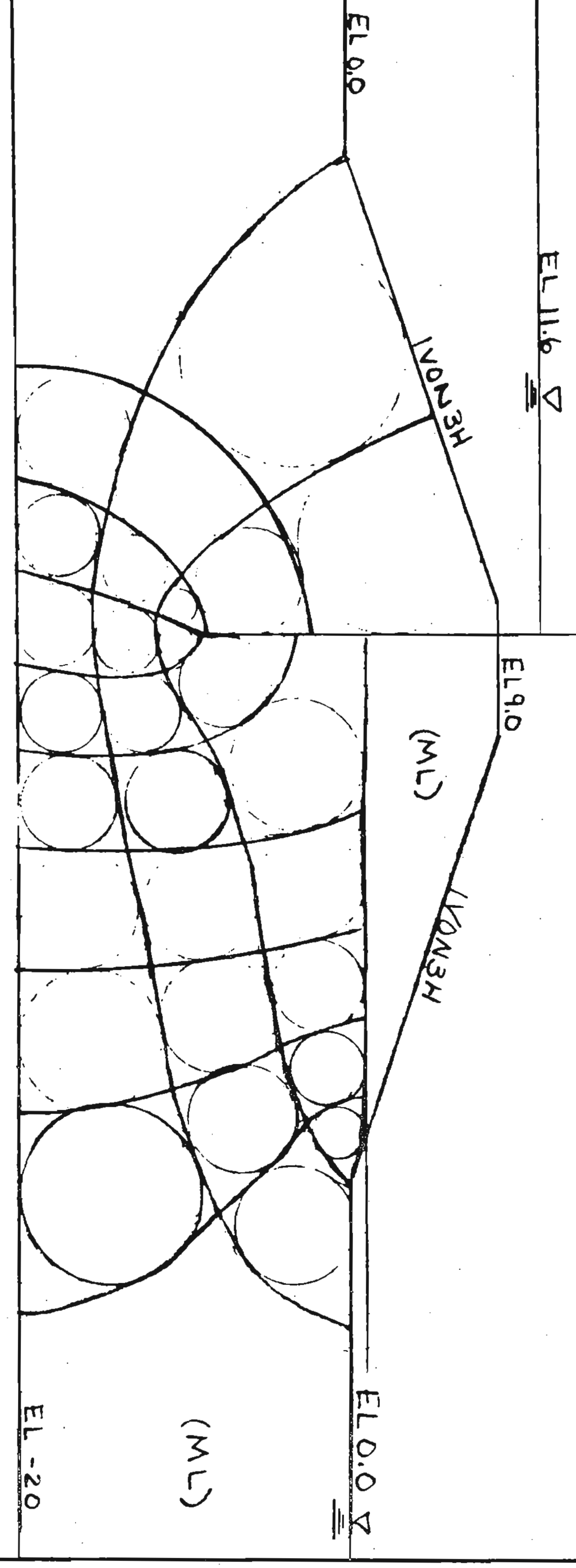
STA 64+00 TO STA 90+50



At Rest Force = 11,640# + 93.8# = 11,734#

COMPUTATION SHEET

PROJECT ORLEANS OUTFALL CANAL	PAGE OF	COMPUTED BY FJV	DATE 1/88
SUBJECT STA 91+25 TO LAKE EASTSIDE		CHECKED BY	DATE



$n_f = 3$
$n_d = 10$

$\Delta H = 11.6$
$\Delta h = \frac{11.6}{10} = 1.16$

$l = 5'$
$i_e = \frac{1.16}{5} = .23$ (OK)

Safe $I_e = .23$ for (ML)

$F.S. = \frac{\frac{54.5}{62.5}}{.23} = 3.8 < 4.0$ (OK) clay layers in above silt formation

PROJECT ORLEANS AVE OUTFALL CANAL	PAGE 1 OF 1	COMPUTED BY FJV	DATE 7/87
SUBJECT VALVE STRUCTURE		CHECKED BY	DATE

LANE'S WEIGHTED CREEP RATIO METHOD

Sheetpile Cutoff to EL -25.0 (5' into clay)

Maximum Head $\Delta H = 12'$ Headwater +7.0 (Lake)

Tailwater -5.0 (Pumping Sta Side)

At Inflow Channel to Outflow Channel

$D = 5' + 11' + 2(10') + 11' + 5' = 52'$ $B = \frac{93.5'}{3} = 31.2'$

$C.R. = \frac{52' + 31.2'}{\Delta H} = \frac{83.2'}{12'} = 6.9 \geq 3.0$ (OK)

At Valve Structure to Outflow Channel

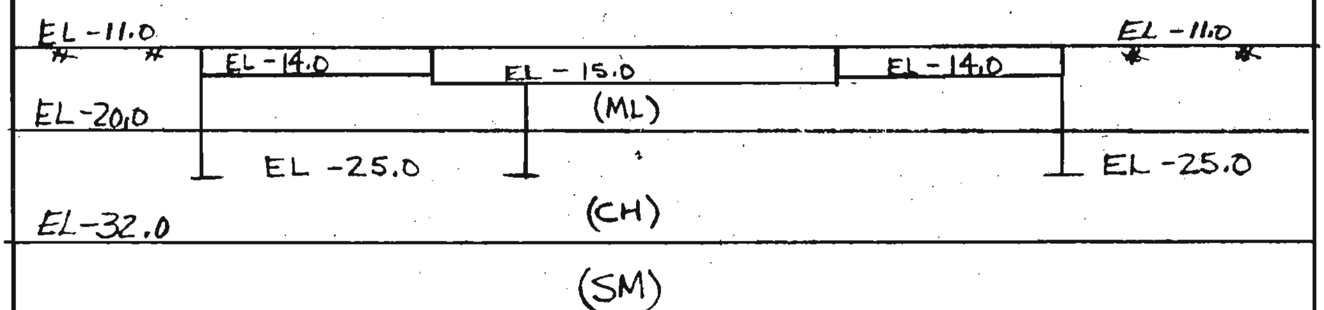
$D = 20' + 11' + 5' = 36'$ $B = \frac{58.5'}{3} = 19.5$

$C.R. = \frac{36' + 19.5'}{12} = 4.6 \geq 3.0$ (OK)

At Valve Structure to Outflow Channel

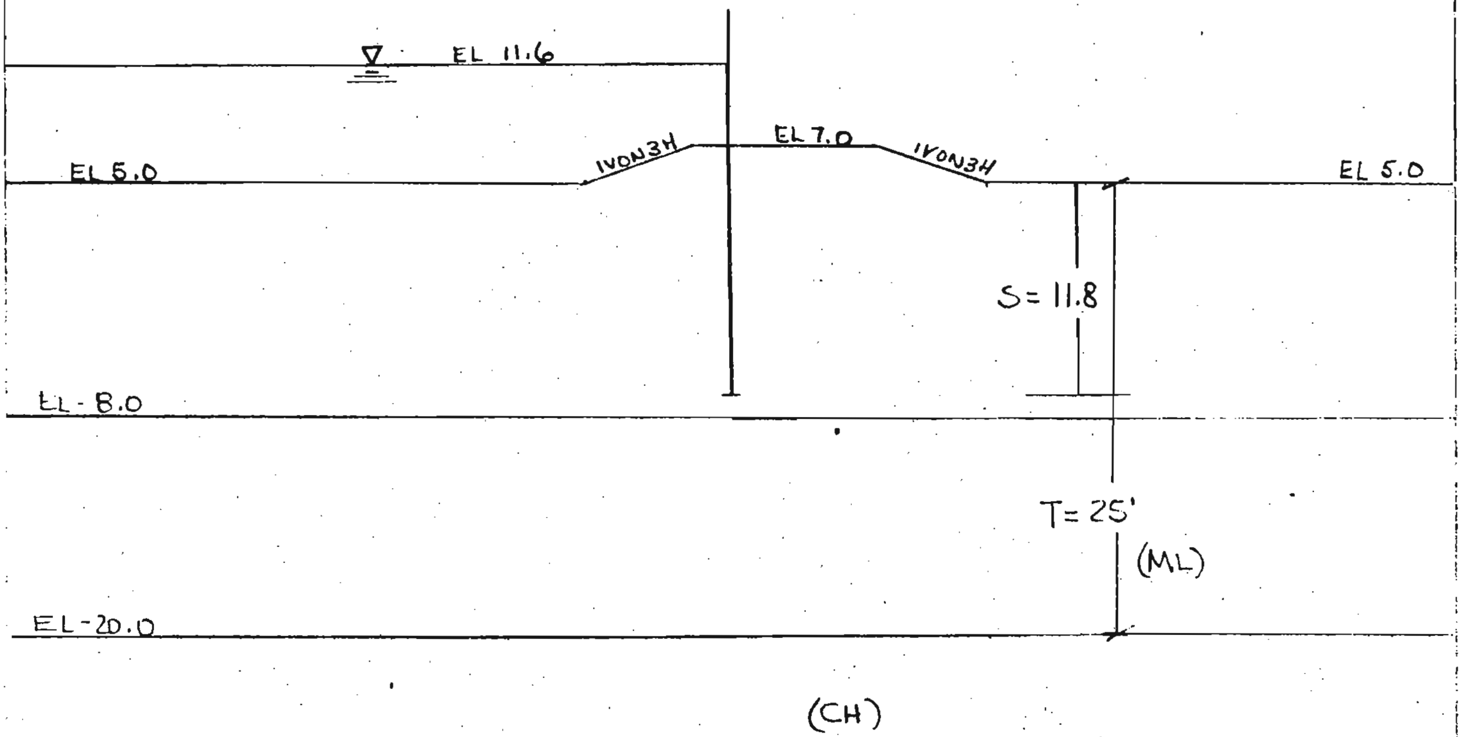
$D = 20' + 11' + 5' = 36'$ $B = 0$

$C.R. = \frac{36'}{12} = 3.0 \geq 3.0$ (OK)



COMPUTATION SHEET

PROJECT ORLEANS AVE OUTFALL CANAL	PAGE 1 OF 1	COMPUTED BY FJV	DATE 7/87
SUBJECT VALVE STRUCTURE WEST CLOSURE LEVEE		CHECKED BY	DATE



$S/T = 11.8/25 = .472$

$2h_m = 4.6$

$h_m = 2.3$

$.59 = \frac{I_E S}{h_m} = \frac{I_e (11.8)}{2.3'}$ $\quad I_e = .12 < \begin{matrix} .34 \text{ (CH)} \\ .23 \text{ (ML)} \end{matrix}$ (OK)

COMPUTATION SHEET

PROJECT ORLEANS AVE OUTFALL CANAL	PAGE 1 OF 1	COMPUTED BY RJV	DATE 7/87
SUBJECT UNDERSEEPAGE EAST LEVEE CLOSURE		CHECKED BY	DATE

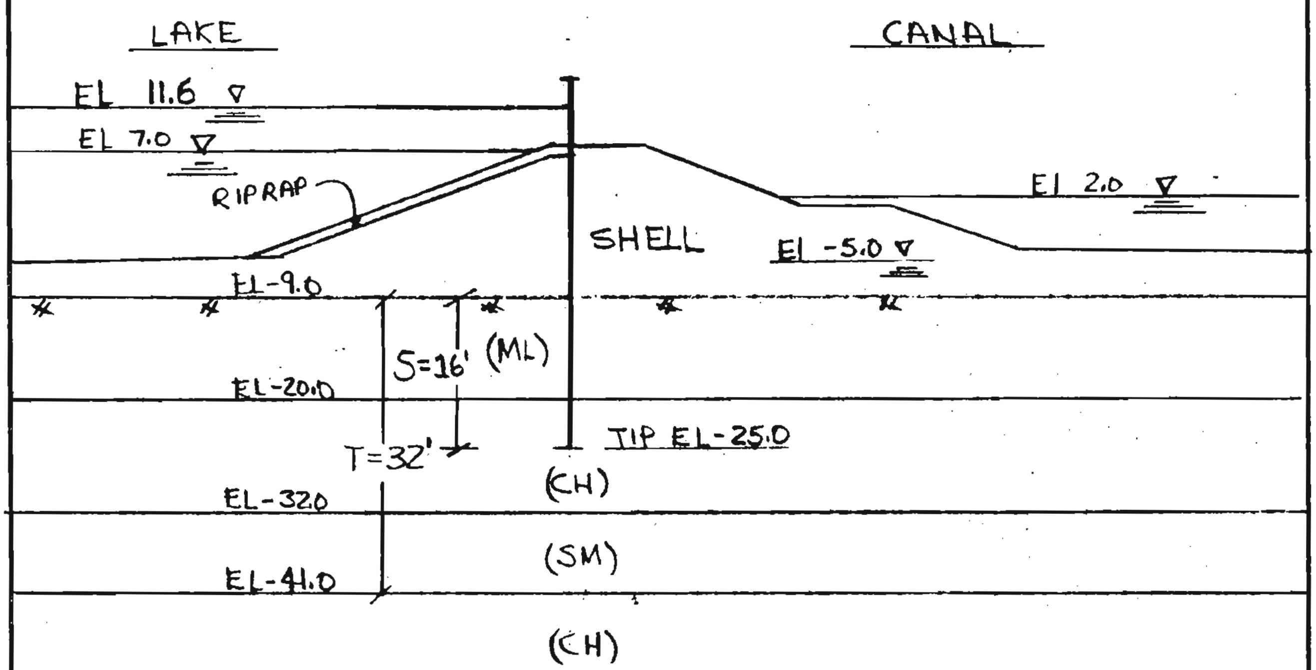
HARR METHOD

T= 32'   S= 16'   2hm = 12'   Headwater +7.0 (Lake)
Tailwater -5.0 (Pumping Station Side)

S/T = .5

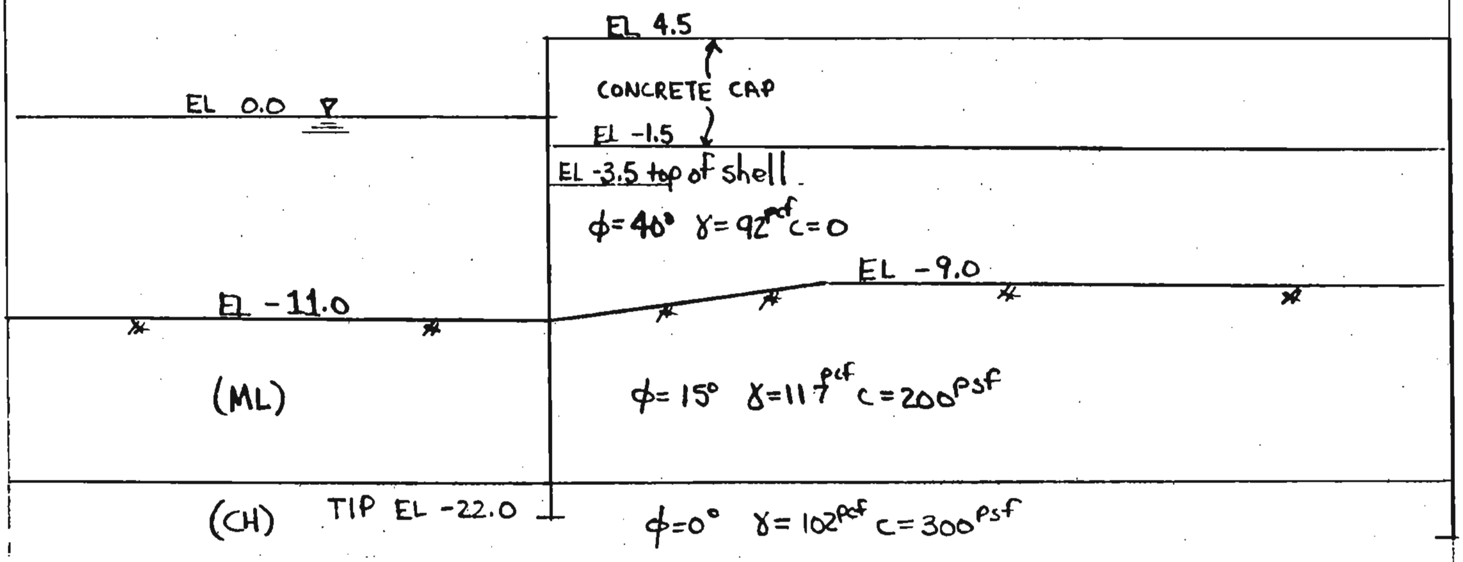
$$\frac{I_e S}{h_m} = .586 = \frac{I_e (16')}{6'} \qquad I_e = .22$$

$$F.S. = \frac{I_{CR}}{I_e} = \frac{54.5\,pcf/62.5\,pcf}{.22} = 4.0 \quad (OK) \geq 4.0 \text{ (silt ML)}$$



COMPUTATION SHEET

PROJECT ORLEANS AVE OUTFALL CANAL	PAGE 1 OF 2	COMPUTED BY FJV	DATE 7/87
SUBJECT APPROACH WALLS EAST SIDE		CHECKED BY	DATE



Concrete Cap: $2' \times 4.5' \times 1' = 9 ft^3 \times 150 pcf = 1350\#$

$1.5' \times 2' \times 1' = 3 ft^3 \times 87.5 pcf = 262.5\#$

$.36 \times 5.5' \times 29.5 pcf \times 2 \times 1' \times 1' = 117\#$

$1730\#/ft$

$K = 1 - \sin\phi = 1 - \sin 40° = .36$

↳ Bowles pg 606 Negative Skin Friction
"↳ Foundation Analysis + Design"

Resistance:

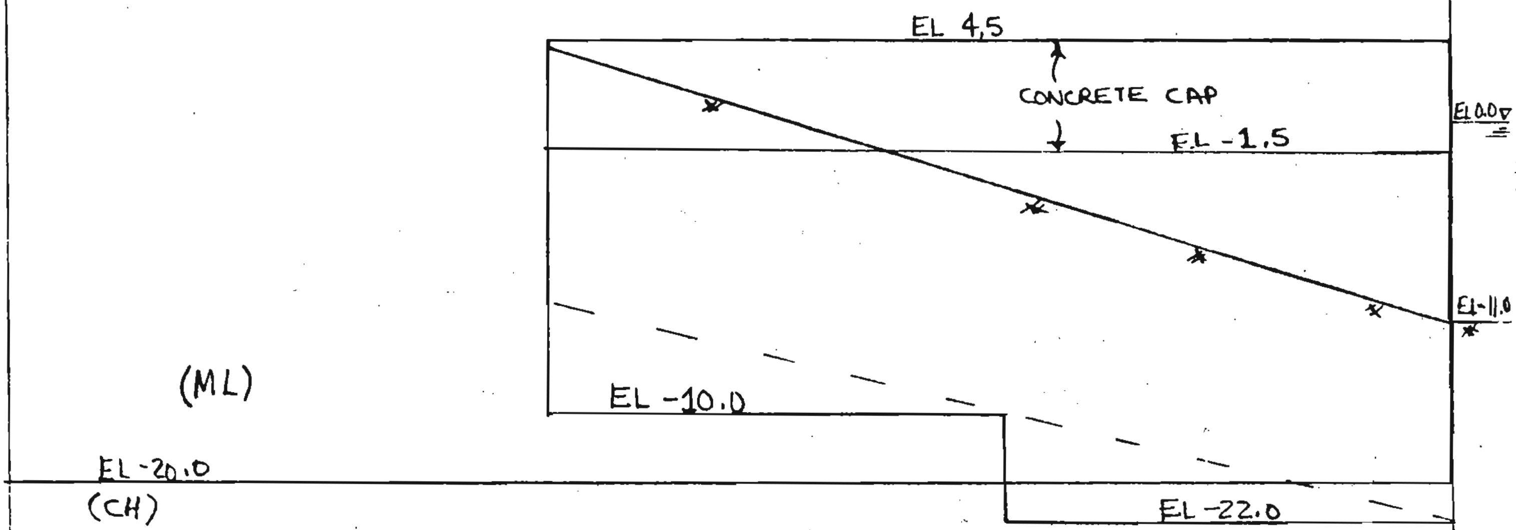
$1' \times 2 \times 9' \times 200^{psf} + (2)(1')\tan 15° \overbrace{(4.5')(54.5^{pcf})}^{P_{AVG}}(9')(.5) + 2'(1')(300^{psf})(2)$

$= 5391\#/ft$

$F.S. = \frac{5391\#/ft}{1730\#/ft} = 3.1 \geq 3.0$ (OK)

COMPUTATION SHEET

PROJECT ORLEANS AVE OUTFALL CANAL	PAGE 2 OF 2	COMPUTED BY FJV	DATE 7/87
SUBJECT APPROACH WALLS WEST SIDE		CHECKED BY	DATE



CONCRETE CAP : $2' \times 4.5' \times 1' \times 150^{pcf} = 1350^{\#}$

$2' \times 1.5' \times 1' \times 87.5^{pcf} = \underline{262.5^{\#}}$

$1613^{\#}$

PILE CAPACITY : $\overset{3600^{\#}}{2' \times 1' \times 9' \times 200\ psf} + 2(1')\tan 15°(4.5')(54.5^{pcf})(9')(.5)$

$+ 2' \times 300^{psf} \times 2 \times 1' = 5391^{\#}$

$F.S. = \frac{5391^{\#}}{1613^{\#}} = 3.3 \geq 3.0$ (OK)

$3 \times 1613^{\#} = 4839^{\#}$

$4839^{\#} / 2 \times 280^{psf} = D$

$D = 8.6'$ $\quad -1.5 - 8.6 = -10.1$ Say Tip @ EL -10.0

2

COMPUTATION SHEET

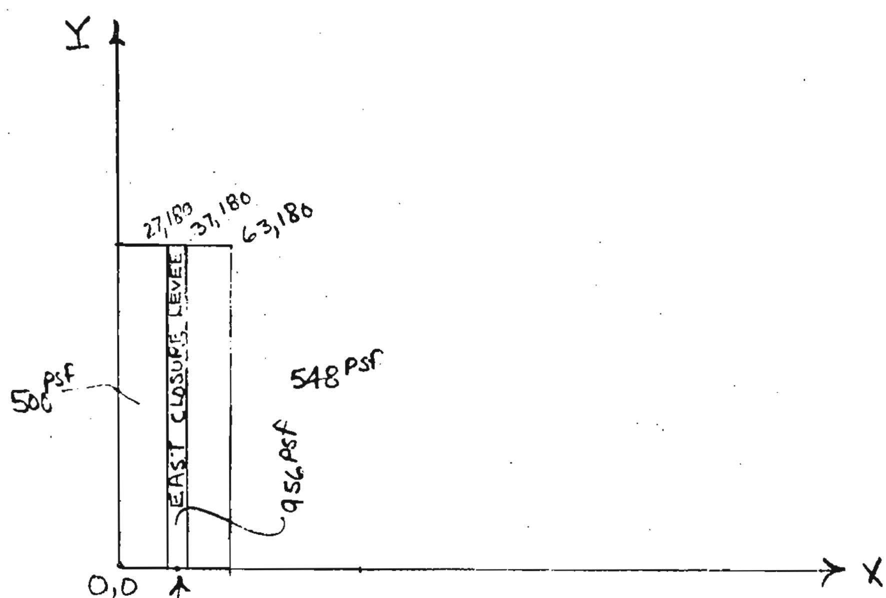
PROJECT EAST CLOSURE LEVEE-VALVE STRUCT.	PAGE OF	COMPUTED BY FJV	DATE 2/87
SUBJECT SETTLEMENT EAST CLOSURE LEVEE		CHECKED BY	DATE

Maximum settlement of East Closure Levee is .64' from Vertical Stress Induction and Settlement Analysis Program. Settlements based only on consolidation of clay layers (neglected silt and sand layers) Used 1 foot overbuild.

For clay layer EL -20 to EL -32 used Bor 4-OUG Sample 4-C
clay layer EL -41 to EL -53 used Bor 4-OUG Sample 11-B
clay layer EL -53 to EL -60 used Bor 4-OUG " "

USED 3-D LOAD Analysis* to Determine settlement where East closure levee ties into structure. Used above soils input data. Subdivided East Closure Levee into three rectangular loads.

* VERTICAL STRESS INDUCTION AND SETTLEMENT ANALYSIS PROGRAM



0,32 → Calculated settlement @ this point
$\Delta S = .12'$

2.

GO

POSITION:
X= 0.0

STRATA NUM.	MID-DEPTH (FEET)	DEL SIG #/SQ FT	SETTLEMENT OF STRATUM IN FEET (TIME PERIOD SPECIFIED IN YEARS) ULT.	0.135	0.270	0.540	1.080	2.160	4.320	8.640	17.280	34.560
1	5.5	926.9	0.036	0.012	0.018	0.024	0.031	0.036	0.036	0.036	0.036	0.036
2	17.0	780.3	0.317	0.095	0.141	0.193	0.260	0.309	0.317	0.317	0.317	0.317
3	27.5	654.3	0.018	0.008	0.011	0.015	0.018	0.018	0.018	0.018	0.018	0.018
4	38.0	562.5	0.168	0.050	0.075	0.102	0.139	0.165	0.168	0.168	0.168	0.168
5	47.5	498.9	0.099	0.052	0.071	0.090	0.099	0.099	0.099	0.099	0.099	0.099
		TOTALS:	0.638	0.217	0.316	0.424	0.547	0.627	0.638	0.638	0.638	0.638

POSITION:
X= 20.0

STRATA NUM.	MID-DEPTH (FEET)	DEL SIG #/SQ FT	SETTLEMENT OF STRATUM IN FEET (TIME PERIOD SPECIFIED IN YEARS) ULT.	0.135	0.270	0.540	1.080	2.160	4.320	8.640	17.280	34.560
1	5.5	446.2	0.019	0.007	0.009	0.012	0.016	0.019	0.019	0.019	0.019	0.019
2	17.0	495.7	0.166	0.050	0.073	0.101	0.137	0.163	0.166	0.166	0.166	0.166
3	27.5	490.3	0.015	0.006	0.009	0.011	0.014	0.015	0.015	0.015	0.015	0.015
4	38.0	463.8	0.134	0.040	0.059	0.082	0.109	0.130	0.134	0.134	0.134	0.134
5	47.5	435.3	0.086	0.046	0.063	0.079	0.086	0.086	0.086	0.086	0.086	0.086
		TOTALS:	0.420	0.149	0.213	0.285	0.362	0.413	0.420	0.420	0.420	0.420

PAUSE: * * * COPY DATA AND CLEAR SCREEN * * *
ENTER 'GO' TO RESUME EXECUTION
GO

POSITION:
X= 32.0 Y= 0.0

STRATA NUM.	MID-DEPTH (FEET)	DEL SIG $/SQ FT	SETTLEMENT OF STRATUM IN FEET (TIME PERIOD SPECIFIED IN YEARS) ULT.	0.135	0.270	0.540	1.080	2.160	4.320	8.640	17.280	34.560
1	5.5	28.5	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
2	17.0	95.9	0.040	0.012	0.016	0.024	0.032	0.039	0.040	0.040	0.040	0.040
3	27.5	135.0	0.005	0.003	0.003	0.003	0.004	0.005	0.005	0.005	0.005	0.005
4	38.0	159.0	0.037	0.012	0.016	0.022	0.030	0.037	0.037	0.037	0.037	0.037
5	47.5	170.7	0.036	0.019	0.026	0.032	0.036	0.036	0.036	0.036	0.036	0.036
		TOTALS:	0.118	0.046	0.061	0.081	0.102	0.117	0.118	0.118	0.118	0.118

POSITION:
X= 26.7 Y= 8.7

STRATA NUM.	MID-DEPTH (FEET)	DEL SIG $/SQ FT	SETTLEMENT OF STRATUM IN FEET (TIME PERIOD SPECIFIED IN YEARS) ULT.	0.135	0.270	0.540	1.080	2.160	4.320	8.640	17.280	34.560
1	5.5	275.3	0.014	0.005	0.007	0.009	0.012	0.014	0.014	0.014	0.014	0.014
2	17.0	248.5	0.096	0.028	0.042	0.059	0.078	0.093	0.096	0.096	0.096	0.096
3	27.5	260.1	0.009	0.003	0.005	0.007	0.008	0.009	0.009	0.009	0.009	0.009
4	38.0	261.8	0.065	0.020	0.028	0.038	0.053	0.062	0.065	0.065	0.065	0.065
5	47.5	254.9	0.052	0.028	0.038	0.048	0.052	0.052	0.052	0.052	0.052	0.052
		TOTALS:	0.236	0.084	0.120	0.161	0.203	0.230	0.236	0.236	0.236	0.236

PAUSE: * * * COPY DATA AND CLEAR SCREEN * * *
ENTER 'GO' TO RESUME EXECUTION

LAKE PONTCHARTRAIN, LOUISIANA AND VICINITY
HIGH LEVEL PLAN
DESIGN MEMORANDUM NO.19, GENERAL DESIGN
ORLEANS AVENUE OUTFALL CANAL

APPENDIX C
DETAIL COST ESTIMATES

LAKE PONTCHARTRAIN ORLEANS OUTFALL CANAL
PHASE I & PHASE II (NOTED BY AN *)

Item	Description	Amount
1	HARRISON AVE. TIE-IN STA. 36+14.85 TO STA. 37+14.85	$32,483
2	FILMORE AVE. TIE-IN STA. 63+77.7 TO STA. 64+51.7	$26,982
3	ROBERT E LEE TIE-IN STA. 90+22.25 TO STA. 91+21.25	$54,307
4	REACH W-6 I-WALL STA. 91+15.16 TO STA. 91+82	$30,354
5	REACH W-6 I-WALL STA. 91+82 TO STA. 118+87	$715,360
6	REACH W-7 I-WALL STA. 118+87 TO STA. 124+87	$215,751
7	REACH E-6 I WALL STA. 91+21.25 TO STA. 91+84.58	$50,275
8	REACH E-6 I-WALL STA. 91+84.58 TO STA. 118+67	$963,748
9	REACH E-7 I-WALL STA. 118+67 TO STA. 124+67	$242,822
10	REACH E-7 I-WALL STA. 124+67 TO STA. 128+67	$173,743
11	* REACH E-1 I-WALL STA. 2+42 TO STA. 3+65	$49,869
12	* REACH E-1 I-WALL STA. 3+65 TO STA. 36+14.85	$883,829
13	* REACH E-2 I-WALL 37+14.85 TO 44+04 & 44+74 TO 50+00	$425,546
14	* REACH E-3 I-WALL STA. 50+00 TO STA. 63+77.7	$557,711
15	* REACH E-4 I-WALL STA. 64+51.7 TO STA. 90+22.25	$1,306,412
16	* REACH W-1 I-WALL STA. 2+40 TO STA. 3+62	$112,317
17	* REACH W-1 I-WALL STA. 3+62 TO 22+80 & 23+40 TO 29+40	$1,795,254
18	* REACH E-2 T-WALL STA. 44+04 TO STA. 44+74	$64,119
19	*REACH W-1 T-WALL STA.22+80 TO STA. 23+40	$107,785
20	* R W-2 T-WALL STA 29+40 - 36+28.35 & 37+00.35 - 50+00	$4,147,959
21	* REACH W-4 T-WALL STA. 50+00 TO SAT. 63+76.76	$2,187,785
22	* REACH W-5 T-WALL STA. 64+54.7 TO SAT. 90+14.66	$5,404,370
23	PUMPING STATION T-WALL TIE-IN	$100,709
24	MOB & DEMOB	$60,000
25	ENVIROMENTAL PROTECTION	$20,000
	OCT. '88 COST } SUBTOTAL	$19,729,488

LAKE PONTCHARTRAIN ORLEANS OUTFALL CANAL
PHASE I & PHASE II (NOTED BY AN *)

Item	Description	Amount
	SUBTOTAL	$19,729,488
26	PUMPING STATION MODIFICATION	$170,530
27	PUMPING STATION COFFERDAM	$258,500
28	HARRISON AVE. BRIDGE	$385,073
29	FILMORE AVE. BRIDGE	$436,090
30	ROBERT E LEE BRIDGE	$531,874
31	UTILITY RELOCATIONS :	
	a) 30"DIA. WATERLINE AT STA. 44+50 ; $5000/SIDE	$10,000
	b) O.H. POWERLINES AT STA. 4+50,37+20,50+50 ; $3450 EA.	$10,350
	SUBTOTAL	$21,531,904
	25% CONTINGENCIES	$5,368,096
	TOTAL CONSTRUCTION (R)	$26,900,000
	ENGINEERING & DESIGN 12%	$3,200,000
	SUPERVISION & ADMIN. 10%	$3,000,000
	OCT. '88 COST — TOTAL COST	$33,100,000

COST ESTIMATE LAKE PONTCHARTRAIN ORLEANS OUTFALL CANAL

Item	Description	Quantity	Unit	Unit Price	Amount
	PHASE I				
1	HARRISON AVE. BRIDGE TIE-IN				
	STA. 36+14.85 TO 37+14.85				
1	PZ-22 STEEL SHEET PILE	602.0	SF	12.00	$7,224
2	PZ-27 STEEL SHEET PILE	234.0	SF	12.50	$2,925
3	REIN. CONC. CAP	27.0	CY	350.00	$9,450
4	EARTH WORK:				
	a) EXCAVATION	102.0	CY	1.00	$102
	b) BACKFILL (SEMICOMPACT)	67.0	CY	5.50	$369
	c) FILL (SEMICOMPACTED)	119.0	CY	4.50	$536
5	ROAD WORK:				
	a) FULLY COMPACTED SOIL	23.0	CY	6.00	$138
	b) SUBBASE	17.0	CY	14.00	$238
	c) REINF. CONC. SLAB	11.0	CY	200.00	$2,200
6	TEMPORARY STOCKPILE	122.0	CY	4.00	$488
7	REQUIRED BORROW	24.0	CY	10.50	$252
8	3-BULB WATERSTOP	6.0	LF	10.00	$60
9	L-TYPE WATYERSTOP	14.0	LF	30.00	$420
10	JOINT MATERIAL	11.0	SF	2.00	$22
	SUBTOTAL				$24,423
	WEST SIDE = .33*EAST				$8,060
				TOTAL	$32,483

COST ESTIMATE		LAKE PONTCHARTRAIN ORLEANS OUTFALL CANAL			
Item	Description	Quantity	Unit	Unit Price	Amount
2	PHASE I FILMORE AVE. BRIDGE TIE-IN STA. 63+77.7 TO 64+51.7				
1	PZ-22 STEEL SHEET PILE	225.0	SF	12.00	$2,700
2	PZ-27 STEEL SHEET PILE	419.0	SF	12.50	$5,238
3	REIN. CONC. CAP	22.0	CY	350.00	$7,700
4	EARTH WORK:				
	a) EXCAVATION	138.0	CY	1.00	$138
	b) BACKFILL (SEMICOMPACT)	75.0	CY	5.50	$413
	c) OMIT				
5	ROAD WORK:				
	a) FULLY COMPACTED SOIL	25.0	CY	6.00	$150
	b) SUBBASE	19.0	CY	14.00	$266
	c) REINF. CONC. SLAB	13.0	CY	200.00	$2,600
6	TEMPORARY STOCKPILE	166.0	CY	3.50	$581
7	OMIT				
8	3-BULB WATERSTOP	6.0	LF	10.00	$60
9	L-TYPE WATYERSTOP	14.0	LF	30.00	$420
10	JOINT MATERIAL	11.0	SF	2.00	$22
	SUBTOTAL				$20,287
	WEST SIDE = 0.33*EAST				$6,695
		4		TOTAL	$26,982

Item	Description	Quantity	Unit	Unit Price	Amount
	COST ESTIMATE				LAKE PONTCHARTRAIN ORLEANS OUTFALL CANAL
3	PHASE I ROBERT E LEE AVE. BRIDGE TIE-IN STA. 90+22.25 TO 91+21.25				
1	PZ-22 STEEL SHEET PILE	1,624.0	SF	12.00	$19,488
2	REIN. CONC. CAP	42.0	CY	350.00	$14,700
3	EARTH WORK:				
	a) EXCAVATION	278.0	CY	1.00	$278
	b) BACKFILL (SEMICOMPACT)	81.0	CY	5.50	$446
	c) FILL (SEMICOMPACTED)	64.0	CY	4.50	$288
4	ROAD WORK:				
	a) FULL COMPACTION	39.0	CY	6.00	$234
	b) SUBBASE (CRUS. STONE)	30.0	CY	14.00	$420
	c) REINF. CONC. SLAB	19.0	CY	200.00	$3,800
5	TEMPORARY STOCKPILE	128.0	CY	3.25	$416
6	REQUIRED BORROW	22.0	CY	10.50	$231
7	3-BULB WATERSTOP	6.0	LF	10.00	$60
8	L-TYPE WATYERSTOP	15.0	LF	30.00	$450
9	JOINT MATERIAL	11.0	SF	2.00	$22
	SUBTOTAL				$40,833
	WEST SIDE =0.33*EAST				$13,475
				TOTAL	$54,307

COST ESTIMATE		LAKE PONTCHARTRAIN ORLEANS OUTFALL CANAL			
Item	Description	Quantity	Unit	Unit Price	Amount
4	PHASE I I-WALL REACH W-6 STA. 91+15.16 TO 91+82				
1	PZ-22 STEEL SHEET PILE	390.0	SF	12.00	$4,680
2	PZ-27 STEEL SHEET PILE	810.0	SF	12.50	$10,125
3	REIN. CONC. CAP	32.0	CY	350.00	$11,200
4	EARTH WORK:				
	a) EXCAVATION	35.0	CY	1.00	$35
	b) BACKFILL (SEMICOMPACT)	52.0	CY	5.50	$286
	c) FILL (SEMICOMPACTED)	157.0	CY	4.50	$707
5	TEMPORARY STOCKPILE	42.0	CY	3.00	$126
6	REQUIRED BORROW	258.0	CY	10.50	$2,709
7	3-BULB WATERSTOP	13.0	LF	10.00	$130
8	L-TYPE WATYERSTOP	9.0	LF	30.00	$270
9	JOINT MATERIAL	18.0	SF	2.00	$36
10	FERT & SEED	.1	AC	500.00	$50
		6		TOTAL	$30,354

COST ESTIMATE	LAKE PONTCHARTRAIN ORLEANS OUTFALL CANAL				
Item	Description	Quantity	Unit	Unit Price	Amount
5	PHASE I I-WALL REACH W-6 STA. 91+82 TO 118+87				
1	PZ-22 STEEL SHEET PILE	25,688.0	SF	12.00	$308,256
2	REIN. CONC. CAP	1,090.0	CY	350.00	$381,500
3	EARTH WORK:				
	a) EXCAVATION	1,696.0	CY	1.00	$1,696
	b) BACKFILL (SEMICOMPACT)	1,345.0	CY	5.50	$7,398
	c) OMIT				
4	TEMPORARY STOCKPILE	2,035.0	CY	3.00	$6,105
5	REQUIRED BORROW	187.0	CY	10.50	$1,964
6	3-BULB WATERSTOP	639.0	LF	10.00	$6,390
7	JOINT MATERIAL	851.0	SF	2.00	$1,702
8	FERT & SEED	.7	AC	500.00	$350
				TOTAL	$715,360

COST ESTIMATE		LAKE PONTCHARTRAIN ORLEANS OUTFALL CANAL			
Item	Description	Quantity	Unit	Unit Price	Amount
6	PHASE I I-WALL REACH W-7 STA. 118+87 TO 124+87				
1	PZ-22 STEEL SHEET PILE	8,540.0	SF	12.00	$102,480
2	REIN. CONC. CAP	309.0	CY	350.00	$108,150
3	EARTH WORK:				
	a) EXCAVATION	376.0	CY	1.00	$376
	b) BACKFILL (SEMICOMPACT)	298.0	CY	5.50	$1,639
	c) OMIT				
4	TEMPORARY STOCKPILE	451.0	CY	.75	$338
5	REQUIRED BORROW	40.0	CY	10.50	$420
6	3-BULB WATERSTOP	176.0	LF	10.00	$1,760
7	JOINT MATERIAL	244.0	SF	2.00	$488
8	FERT & SEED	.2	AC	500.00	$100
		8		TOTAL	$215,751

COST ESTIMATE		LAKE PONTCHARTRAIN ORLEANS OUTFALL CANAL			
Item	Description	Quantity	Unit	Unit Price	Amount
7	PHASE I I-WALL REACH E-6 STA. 91+21.25 TO 91+84.58				
1	PZ-22 STEEL SHEET PILE	1,534.0	SF	12.00	$18,408
2	REIN. CONC. CAP	57.0	CY	350.00	$19,950
3	EARTH WORK:				
	a) EXCAVATION	107.0	CY	1.00	$107
	b) BACKFILL (SEMICOMPACT)	129.0	CY	5.50	$710
	c) FILL (SEMICOMPACTED)	427.0	CY	4.50	$1,922
4	TEMPORARY STOCKPILE	128.0	CY	3.25	$416
5	REQUIRED BORROW	778.0	CY	10.50	$8,169
6	3-BULB WATERSTOP	28.0	LF	10.00	$280
7	L-TYPE WATYERSTOP	6.0	LF	30.00	$180
8	JOINT MATERIAL	42.0	SF	2.00	$84
9	FERT & SEED	.1	AC	500.00	$50
		9		TOTAL	$50,275

COST ESTIMATE		LAKE PONTCHARTRAIN ORLEANS OUTFALL CANAL			
Item	Description	Quantity	Unit	Unit Price	Amount
8	PHASE I I-WALL REACH E-6 STA. 91+84.58 TO 118+67				
1	PZ-22 STEEL SHEET PILE	46,625.0	SF	12.00	$559,500
2	REIN. CONC. CAP	1,082.0	CY	350.00	$378,700
3	EARTH WORK:				
	a) EXCAVATION	1,661.0	CY	1.00	$1,661
	b) BACKFILL (SEMICOMPACT)	1,343.0	CY	5.50	$7,387
	c) OMIT				
4	TEMPORARY STOCKPILE	1,993.0	CY	3.00	$5,979
5	REQUIRED BORROW	219.0	CY	10.50	$2,300
6	3-BULB WATERSTOP	639.0	LF	10.00	$6,390
7	JOINT MATERIAL	916.0	SF	2.00	$1,832
				TOTAL	$963,748

COST ESTIMATE		LAKE PONTCHARTRAIN ORLEANS OUTFALL CANAL			
Item	Description	Quantity	Unit	Unit Price	Amount
9	PHASE I I-WALL REACH E-7 STA. 118+67 TO 124+67				
1	PZ-22 STEEL SHEET PILE	11,400.0	SF	12.00	$136,800
2	REIN. CONC. CAP	286.0	CY	350.00	$100,100
3	EARTH WORK:				
	a) EXCAVATION	376.0	CY	1.00	$376
	b) BACKFILL (SEMICOMPACT)	300.0	CY	5.50	$1,650
	c) FILL (SEMICOMPACTED)		CY		
4	TEMPORARY STOCKPILE	451.0	CY	2.75	$1,240
5	REQUIRED BORROW	44.0	CY	10.50	$462
6	3-BULB WATERSTOP	171.0	LF	10.00	$1,710
7	JOINT MATERIAL	242.0	SF	2.00	$484
				TOTAL	$242,822

COST ESTIMATE		LAKE PONTCHARTRAIN ORLEANS OUTFALL CANAL			
Item	Description	Quantity	Unit	Unit Price	Amount
10	PHASE I I-WALL REACH E-7 STA. 124+67 TO 128+67				
1	PZ-22 STEEL SHEET PILE	8,000.0	SF	12.00	$96,000
2	REIN. CONC. CAP	210.0	CY	350.00	$73,500
3	EARTH WORK:				
	a) EXCAVATION	251.0	CY	1.00	$251
	b) BACKFILL (SEMICOMPACT)	199.0	CY	5.50	$1,095
	c) OMIT				
4	TEMPORARY STOCKPILE	301.0	CY	2.75	$828
5	REQUIRED BORROW	28.0	CY	10.50	$294
6	3-BULB WATERSTOP	126.0	LF	10.00	$1,260
7	JOINT MATERIAL	183.0	SF	2.00	$366
8	FER & SEED	.3	AC	500.00	$150
		12		TOTAL	$173,743

COST ESTIMATE		LAKE PONTCHARTRAIN ORLEANS OUTFALL CANAL			
Item	Description	Quantity	Unit	Unit Price	Amount
1/	PHASE II I-WALL REACH E-1 STA. 2+42 TO 3+65				
1	PZ-22 STEEL SHEET PILE	1,230.0	SF	12.00	$14,760
2	REIN. CONC. CAP	50.0	CY	350.00	$17,500
3	EARTH WORK:				
	a) EXCAVATION	77.0	CY	1.00	$77
	b) BACKFILL (SEMICOMPACT)	61.0	CY	5.50	$336
	c) OMIT				
4	TEMPORARY STOCKPILE	92.0	CY	3.75	$345
5	REQUIRED BORROW	10.0	CY	10.50	$105
6	3-BULB WATERSTOP	27.0	LF	10.00	$270
7	JOINT MATERIAL	38.0	SF	2.00	$76
8	SHEET PILE SPLICES	82.0	EA	200.00	$16,400
				TOTAL	$49,869

COST ESTIMATE		LAKE PONTCHARTRAIN ORLEANS OUTFALL CANAL			
Item	Description	Quantity	Unit	Unit Price	Amount
12	PHASE II I-WALL REACH E-1 STA. 3+65 TO 36+14.85				
1	PZ-22 STEEL SHEET PILE	32,500.0	SF	12.00	$390,000
2	REIN. CONC. CAP	1,327.0	CY	350.00	$464,450
3	EARTH WORK:				
	a) EXCAVATION	2,040.0	CY	1.00	$2,040
	b) BACKFILL (SEMICOMPACT)	1,627.0	CY	5.50	$8,949
	c) OMIT				
4	TEMPORARY STOCKPILE	2,440.0	CY	3.50	$8,540
5	OMIT				
6	3-BULB WATERSTOP	737.0	LF	10.00	$7,370
7	JOINT MATERIAL	1,040.0	SF	2.00	$2,080
8	FERT & SEED	.8	AC	500.00	$400
				TOTAL	$883,829

COST ESTIMATE LAKE PONTCHARTRAIN ORLEANS OUTFALL CANAL

Item	Description	Quantity	Unit	Unit Price	Amount
	PHASE II I-WALL REACH E-2				
13	STA. 36+14.85 TO 44+04 STA. 44+74 TO 50+00				
1	PZ-22 STEEL SHEET PILE	8,825.0	SF	12.00	$105,900
2	REIN. CONC. CAP	652.0	CY	350.00	$228,200
3	EARTH WORK:				
	a) EXCAVATION	2,815.0	CY	1.00	$2,815
	b) BACKFILL (SEMICOMPACT)	1,600.0	CY	5.50	$8,800
	c) FILL (SEMICOMPACTED)	4,238.0	CY	4.50	$19,071
4	TEMPORARY STOCKPILE	2,240.0	CY	3.50	$7,840
5	REQUIRED BORROW	4,460.0	CY	10.50	$46,830
6	3-BULB WATERSTOP	390.0	LF	10.00	$3,900
7	JOINT MATERIAL	520.0	SF	2.00	$1,040
8	FERT & SEED	2.3	AC	500.00	$1,150
				TOTAL	$425,546

COST ESTIMATE LAKE PONTCHARTRAIN ORLEANS OUTFALL CANAL

Item	Description	Quantity	Unit	Unit Price	Amount
14	PHASE II I-WALL REACH E-3 STA. 50+00 TO 63+77.7				
1	PZ-22 STEEL SHEET PILE	11,989.0	SF	12.00	$143,868
2	REIN. CONC. CAP	829.0	CY	350.00	$290,150
3	EARTH WORK:				
	a) EXCAVATION	4,060.0	CY	1.00	$4,060
	b) BACKFILL (SEMICOMPACT)	1,840.0	CY	5.50	$10,120
	c) FILL (SEMICOMPACTED)	5,890.0	CY	4.50	$26,505
4	TEMPORARY STOCKPILE	4,870.0	CY	3.50	$17,045
5	REQUIRED BORROW	5,590.0	CY	10.50	$58,695
6	3-BULB WATERSTOP	483.0	LF	10.00	$4,830
7	JOINT MATERIAL	544.0	SF	2.00	$1,088
8	FERT & SEED	2.7	AC	500.00	$1,350
				TOTAL	$557,711

COST ESTIMATE		LAKE PONTCHARTRAIN ORLEANS OUTFALL CANAL			
Item	Description	Quantity	Unit	Unit Price	Amount
15	PHASE II I-WALL REACH E-4 STA. 64+51.7 TO 90+22.25				
1	PZ-22 STEEL SHEET PILE	42,390.0	SF	12.00	$508,680
2	REIN. CONC. CAP	1,914.0	CY	350.00	$669,900
3	EARTH WORK:				
	a) EXCAVATION	13,067.0	CY	1.00	$13,067
	b) BACKFILL (SEMICOMPACT)	4,710.0	CY	5.50	$25,905
	c) FILL (SEMICOMPACTED)	4,020.0	CY	4.50	$18,090
4	TEMPORARY STOCKPILE	15,700.0	CY	3.00	$47,100
5	ECESS MATERAL	840.0	CY	10.50	$8,820
6	3-BULB WATERSTOP	1,070.0	LF	10.00	$10,700
7	JOINT MATERIAL	1,450.0	SF	2.00	$2,900
8	DERT & SEED	2.5	AC	500.00	$1,250
				TOTAL	$1,306,412

COST ESTIMATE		LAKE PONTCHARTRAIN ORLEANS OUTFALL CANAL			
Item	Description	Quantity	Unit	Unit Price	Amount
16	PHASE II I-WALL REACH W-1 STA. 2+40 TO 3+62				
1	PZ-27 STEEL SHEET PILE	2,477.0	SF	12.00	$29,724
2	REIN. CONC. CAP	113.0	CY	350.00	$39,550
3	EARTH WORK:				
	a) EXCAVATION	237.0	CY	1.00	$237
	b) BACKFILL (SEMICOMPACT)	254.0	CY	5.50	$1,397
	c) OMIT				
4	TEMPORARY STOCKPILE	284.0	CY	3.75	$1,065
5	REQUIRED BORROW	119.0	CY	10.50	$1,250
6	3-BULB WATERSTOP	28.0	LF	10.00	$280
7	JOINT MATERIAL	32.0	SF	2.00	$64
8	SHEET PILE SPLICE	163.0	EA	200.00	$32,600
9	REMOVE EXISTING I-WALL	122.0	LF	50.00	$6,100
10	FERT & SEED	.1	AC	500.00	$50
				TOTAL	$112,317

COST ESTIMATE	LAKE PONTCHARTRAIN ORLEANS OUTFALL CANAL				
Item	Description	Quantity	Unit	Unit Price	Amount
17	PHASE II I-WALL REACH W-1 STA. 3+62 TO 22+80 STA. 23+40 TO 29+40				
1	PZ-27 STEEL SHEET PILE	51,100.0	SF	12.50	$638,750
2	REIN. CONC. CAP	2,340.0	CY	350.00	$819,000
3	EARTH WORK:				
	a) EXCAVATION	4,890.0	CY	1.00	$4,890
	b) BACKFILL (SEMICOMPACT)	5,240.0	CY	5.50	$28,820
	c) OMIT				
4	OMIT				
5	OMIT				
6	3-BULB WATERSTOP	390.0	LF	10.00	$3,900
7	JOINT MATERIAL	520.0	SF	2.00	$1,040
8	ROAD WORK:				
	a) REMOVE EXISTING RD SURF.	6,156.0	SY	5.00	$30,780
	b) NEW RD. SURFACE	6,156.0	SY	10.00	$61,560
	c) SUBBASE	5,422.0	TON	14.00	$75,908
	d) FILL (UNCOMPACTED)	420.0	CY	1.80	$756
	e) SEMICOMPACTED SHOULDER	700.0	CY	4.50	$3,150
9	FERT & SEED	1.6	AC	500.00	$800
10	I-WALL REMOVAL	2,518.0	LF	50.00	$125,900
				TOTAL	$1,795,254

COST ESTIMATE		LAKE PONTCHARTRAIN ORLEANS OUTFALL CANAL			
Item	Description	Quantity	Unit	Unit Price	Amount
18	PHASE II T-WALL REACH E-2 STA. 44+04 TO 44+74				
1	PZ-22 STEEL SHEET PILE	330.0	SF	12.00	$3,960
2	REIN. CONC. CAP				
	a) STEM	43.0	CY	400.00	$17,200
	b) SLAB	44.0	CY	200.00	$8,800
	c) STABLIZATION SLAB	6.0	CY	70.00	$420
3	EARTH WORK:				
	a) EXCAVATION	150.0	CY	1.00	$150
	b) BACKFILL (SEMICOMPACT)	27.0	CY	5.50	$149
	c) OMIT				
4	OMIT				
5	OMIT				
6	3-BULB WATERSTOP	1,070.0	LF	10.00	$10,700
7	JOINT MATERIAL	12.0	SF	2.00	$24
8	L-TYPE WATERSTOP	18.0	LF	30.00	$540
9	12"sq. PRESTRESS CONC. PILE	1,232.0	LF	18.00	$22,176
		20		TOTAL	$64,119

COST ESTIMATE		LAKE PONTCHARTRAIN ORLEANS OUTFALL CANAL			
Item	Description	Quantity	Unit	Unit Price	Amount
19	PHASE II T-WALL REACH W-1 STA. 22+80 TO 23+40				
1	PZ-22 STEEL SHEET PILE	1,890.0	SF	12.00	$22,680
2	REIN. CONC. CAP (T-WALL)				
	a) STEM	57.0	CY	400.00	$22,800
	b) SLAB	44.0	CY	200.00	$8,800
	c) STABLIZATION SLAB	6.0	CY	70.00	$420
3	EARTH WORK:				
	a) EXCAVATION	378.0	CY	1.00	$378
	b) BACKFILL (SEMICOMPACT)	84.0	CY	5.50	$462
4	12"sq. PRESTRESS CONC. PILE	1,860.0	LF	18.00	$33,480
5	OMIT				
6	COFFERDAM:				
	a) PZ-35 (DRIVE & PULL)	2,340.0	SF	4.00	$9,360
	b) BACKFILL (SHEET PILE)	270.0	CY	5.50	$1,485
	c) RESHAPE CHANNEL	270.0	CY	1.00	$270
7	REMOVE & DISPOSE OF EXISTING I-WALL	60.0	LF	80.00	$4,800
8	TEMPORARY STOCKPILE	130.0	CY	3.75	$488
9	EXCESS MATERAL	350.0	CY	3.75	$1,313
10	DEWATER		LS	1,000.00	$1,000
11	FERT & SEED	.1	AC	500.00	$50
		21		TOTAL	$107,785

COST ESTIMATE		LAKE PONTCHARTRAIN ORLEANS OUTFALL CANAL			
Item	Description	Quantity	Unit	Unit Price	Amount
20	PHASE II T-WALL REACH W-2 STA. 29+40 TO 36+28.35 STA. 37+00.35 TO 50+00				
1	PZ-22 STEEL SHEET PILE	62,622.0	SF	12.00	$751,464
2	REIN. CONC. CAP (T-WALL)				
	a) STEM	1,894.0	CY	400.00	$757,600
	b) SLAB	1,473.0	CY	200.00	$294,600
	c) STABLIZATION SLAB	196.0	CY	70.00	$13,720
3	EARTH WORK:				
	a) EXCAVATION	12,500.0	CY	1.00	$12,500
	b) BACKFILL (SEMICOMPACT)	2,780.0	CY	5.50	$15,290
4	12"sq. PRESTRESS CONC. PILE	61,600.0	LF	18.00	$1,108,800
5	REMOVE & DESPOSE OF EXISTI' REINF. CONC. RETAINING WALL	1,990.0	LF	80.00	$159,200
6	COFFERDAM:				
	a) PZ-35 (DRIVE & PULL)	83,500.0	SF	4.00	$334,000
	b) PZ-35 STEEL SHEET PILE	24,200.0	SF	16.50	$399,300
	b) BACKFILL (SHEET PILE)	8,950.0	CY	5.50	$49,225
	c) RESHAPE CHANNEL	10,740.0	CY	1.00	$10,740
7	REMOVE & DISPOSE OF EXISTING I-WALL	1,990.0	LF	80.00	$159,200
8	TEMPORARY STOCKPILE	4,260.0	CY	4.50	$19,170
9	EXCESS MATERAL	11,700.0	CY	4.50	$52,650
10	DEWATER		LS	10,000.00	$10,000
11	FERT & SEED	1.0	AC	500.00	$500
				TOTAL	$4,147,959

COST ESTIMATE		LAKE PONTCHARTRAIN ORLEANS OUTFALL CANAL			
Item	Description	Quantity	Unit	Unit Price	Amount
2/	PHASE II T-WALL REACH W-4 STA. 50+00 TO 63+76.7				
1	PZ-22 STEEL SHEET PILE	23,400.0	SF	12.00	$280,800
2	REIN. CONC. CAP (T-WALL)				
	a) STEM	937.0	CY	400.00	$374,800
	b) SLAB	1,020.0	CY	200.00	$204,000
	c) STABLIZATION SLAB	136.0	CY	70.00	$9,520
3	EARTH WORK:				
	a) EXCAVATION	11,600.0	CY	1.00	$11,600
	b) BACKFILL (SEMICOMPACT)	2,600.0	CY	5.50	$14,300
4	12"sq. PRESTRESS CONC. PILE	47,100.0	LF	18.00	$847,800
5	REMOVE & DESPOSE OF EXISTI' REINF. CONC. RETAINING WALL	1,380.0	LF	50.00	$69,000
6	COFFERDAM:				
	a) PZ-35 (DRIVE & PULL)	37,200.0	SF	4.00	$148,800
	b) BACKFILL (SHEET PILE)	6,200.0	CY	5.50	$34,100
	c) RESHAPE CHANNEL	7,440.0	CY	1.00	$7,440
7	REMOVE & DISPOSE OF EXISTING I-WALL	1,380.0	LF	80.00	$110,400
8	TEMPORARY STOCKPILE	6,500.0	CY	3.75	$24,375
9	EXCESS MATERAL	10,800.0	CY	3.75	$40,500
10	DEWATER		LS	10,000.00	$10,000
11	FERT & SEED	.7	AC	500.00	$350
				TOTAL	$2,187,785

COST ESTIMATE	LAKE PONTCHARTRAIN ORLEANS OUTFALL CANAL				
Item	Description	Quantity	Unit	Unit Price	Amount
22	PHASE II T-WALL REACH W-5 STA. 64+54.7 TO 90+14.66				
1	PZ-22 STEEL SHEET PILE	45,300.0	SF	12.50	$566,250
2	REIN. CONC. CAP (T-WALL)				
	a) STEM	2,960.0	CY	400.00	$1,184,000
	b) SLAB	1,900.0	CY	200.00	$380,000
	c) STABLIZATION SLAB	253.0	CY	70.00	$17,710
3	EARTH WORK:				
	a) EXCAVATION	21,700.0	CY	1.00	$21,700
	b) BACKFILL (SEMICOMPACT)	5,120.0	CY	5.50	$28,160
4	12"sq. PRESTRESS CONC. PILE	87,700.0	LF	18.00	$1,578,600
5	REMOVE & DESPOSE OF EXISTI' REINF. CONC. RETAINING WALL	2,560.0	LF	50.00	$128,000
6	COFFERDAM:				
	a) PZ-35 (DRIVE & PULL)	73,000.0	SF	15.00	$1,095,000
	b) BACKFILL (SHEET PILE)	11,500.0	CY	5.50	$63,250
	c) RESHAPE CHANNEL	13,800.0	CY	1.00	$13,800
7	REMOVE & DISPOSE OF EXISTING I-WALL	2,560.0	LF	80.00	$204,800
8	TEMPORARY STOCKPILE	12,200.0	CY	3.50	$42,700
9	EXCESS MATERAL	19,900.0	CY	3.50	$69,650
10	DEWATER		LS	10,000.00	$10,000
11	FERT & SEED	1.5	AC	500.00	$750
				TOTAL	$5,404,370

COST ESTIMATE		LAKE PONTCHARTRAIN ORLEANS OUTFALL CANAL			
Item	Description	Quantity	Unit	Unit Price	Amount
23	PUMPING STATION T-WALL TIE-IN				
1	PZ-22 STEEL SHEET PILE	1,350.0	SF	12.00	$16,200
2	REINF.CONC.				
	a) STEM	77.0	CY	400.00	$30,800
	b) BASE SLAB	67.0	CY	200.00	$13,400
	c) STABLIZATION SLAB	9.0	CY	70.00	$630
3	12"sq PRESTRESS PILE	1,938.0	LF	18.00	$34,884
4	EXCAVATION	125.0	CY	1.00	$125
5	RESHAPE LEVEE		LS	3,000.00	$3,000
6	3-BULB WATERSTOP	85.0	LF	10.00	$850
7	L-TYPE WATERSTOP	18.0	LF	30.00	$540
8	JOINT MATERAL	140.0	SF	2.00	$280
				TOTAL	$100,709

COST ESTIMATE LAKE PONTCHARTRAIN ORLEANS OUTFALL CANAL

Item	Description	Quantity	Unit	Unit Price	Amount
26	PUMPING STATION MODIFICATION				
1	PZ-22 STEEL SHEET PILE	4,425.0	SF	12.00	$53,100
2	REINF. CONC. CAP	66.0	CY	350.00	$23,100
3	NEOPRENE SEAL 30" X 1/2"	750.0	LF	4.00	$3,000
4	CRS ANCHOR BOLT 1/2"DIA.X6"	150.0	EA	2.50	$375
5	1" X 3" CRS BAR	165.0	LF	3.00	$495
6	8"CONC. EXTERIA COVER ON PS				
	a) SANDBLAST EXTEDRIA WALL	2,600.0	SF	2.00	$5,200
	b) DRILL 1"dia. X 8" HOLE	2,700.0	EA	10.00	$27,000
	c) EPOXY #3 REBAR	2,700.0	EA	1.00	$2,700
	d) EPOXY COAT EXTERRIA WALL	2,600.0	SF	2.00	$5,200
	e) 8" REINF. CONC. COVER	77.0	CY	600.00	$46,200
7	AIR COMPERESSOR 1 1/2 H.P.		LS	1,000.00	$1,000
8	PORTABLE 5 KW GENERATOR		LS	1,700.00	$1,700
9	AIR STORAGE TANK		LS	500.00	$500
10	3-BULB WATERSTOP	90.0	LF	10.00	$900
11	JOINT MATERIAL	30.0	SF	2.00	$60
				TOTAL	$170,530

COST ESTIMATE		LAKE PONTCHARTRAIN ORLEANS OUTFALL CANAL			
Item	Description	Quantity	Unit	Unit Price	Amount
27	PUMPING STATION COFFERDAM				
1	PZ-27 STEEL SHEET PILE	9,800.0	SF	12.50	$122,500
2	HP 14 x 73	2,250.0	LF	24.00	$54,000
3	W 18 x 76	200.0	LF	35.00	$7,000
4	DEWATER		LS	40,000.00	$40,000
5	REMOVAL OF COFFERDAM		LS	35,000.00	$35,000
				TOTAL	$258,500

COST ESTIMATE		LAKE PONTCHARTRAIN ORLEANS OUTFALL CANAL			
Item	Description	Quantity	Unit	Unit Price	Amount
28	PHASE I HARRISON AVE. BRIDGE				
1	REMOVE REIN. CONC. DECK	350.0	TONS	300.00	$105,000
2	REMOVE & SANDBLAST W18X96 PAINT & REPLACE W18X96		LS	15,000.00	$15,000
3	WELD 7/8"X4" HEADED STUDS	2,660.0	EA	1.25	$3,325
4	NEW BOLTS & HOLES (A325 1 1/4"DIA X9" W/ANCHORS	140.0	EA	6.50	$910
5	NON-CONTINUOUS ED L8X8X7/8" (W/2-ANCHOR @ 1'O.C.)	300.0	LF	27.00	$8,100
6	DECK JOINT L2X2X3/4" (W/ANCHORS @ 1'O.C.)	300.0	LF	12.00	$3,600
7	REIN. CONC.DECK				
	a) SLAB	94.0	CY	200.00	$18,800
	b) WALL	96.0	CY	450.00	$43,200
	c) SIDEWALK	65.0	CY	120.00	$7,800
	d) NEW CONC. ANCHOR BEAM	69.0	CY	450.00	$31,050
	e) COLUMN @ ANCHOR BEAM	1.0	CY	450.00	$450
8	16"sq PRESTRESS CONC. PILE	3,140.0	LF	20.00	$62,800
9	3-BULB WATERSTOP(12-ANG)	282.0	LF	10.00	$2,820
10	L-TYPE WATERSTOP	109.0	LF	30.00	$3,270
11	L-TYPE W-S CRS HARDWARE	109.0	LF	30.00	$3,270
12	JOINT MATERAL	279.0	SF	2.00	$558
13	WALL RUSTIFICATION	1,560.0	SF	27.00	$42,120
14	RELOCATIONS		LS	33,000.00	$33,000
				TOTAL	$385,073

COST ESTIMATE		LAKE PONTCHARTRAIN ORLEANS OUTFALL CANAL			
Item	Description	Quantity	Unit	Unit Price	Amount
	PHASE I				
29	FILMORE AVE. BRIDGE				
1	REMOVE REIN. CONC. DECK	474.0	TONS	300.00	$142,200
2	REMOVE & SANDBLAST W24X110 DIAPHRAMS PAINT & REPLACE W24X110		LS	15,000.00	$15,000
3	WELD 7/8"X4" HEADED STUDS	3,150.0	EA	1.25	$3,938
4	NEW BOLTS & HOLES (A325 1 1/4"DIA X9" W/ANCHORS	140.0	EA	6.50	$910
5	NON-CONTINUOUS ED L8X8X7/8" (W/2-ANCHOR @ 1'O.C.)	230.0	LF	27.00	$6,210
6	DECK JOINT L2X2X3/4" (W/ANCHORS @ 1'O.C.)	230.0	LF	12.00	$2,760
7	REIN. CONC.DECK				
	a) SLAB	144.0	CY	200.00	$28,800
	b) WALL	132.0	CY	450.00	$59,400
	c) SIDEWALK	89.0	CY	120.00	$10,680
	d) NEW CONC. ANCHOR BEAM	64.0	CY	450.00	$28,800
	e) COLUMN @ ANCHOR BEAM	1.0	CY	450.00	$450
8	16"sq PRESTRESS CONC. PILE	3,700.0	LF	20.00	$74,000
9	3-BULB WATERSTOP(12-ANG)	279.0	LF	10.00	$2,790
10	L-TYPE WATERSTOP	135.0	LF	30.00	$4,050
11	L-TYPE W-S CRS HARDWARE	135.0	LF	30.00	$4,050
12	JOINT MATERAL	466.0	SF	2.00	$932
13	WALL RUSTIFICATION	1,560.0	SF	27.00	$42,120
14	RELOCATIONS		LS	9,000.00	$9,000
				TOTAL	$436,090

COST ESTIMATE		LAKE PONTCHARTRAIN ORLEANS OUTFALL CANAL			
Item	Description	Quantity	Unit	Unit Price	Amount
30	PHASE I ROBERT E LEE AVE. BRIDGE				
1	REMOVE REIN. CONC. DECK	501.0	TONS	300.00	$150,300
2	REMOVE & SANDBLAST W24X100 DIAPHRAMS PAINT & REPLACE W24X100		LS	15,000.00	$15,000
3	WELD 7/8"X4" HEADED STUDS	4,032.0	EA	1.25	$5,040
4	NEW BOLTS & HOLES (A325 1 1/4"DIA X9" W/ANCHORS	128.0	EA	6.50	$832
5	NON-CONTINUOUS ED L8X8X7/8" (W/2-ANCHOR @ 1'O.C.)	460.0	LF	27.00	$12,420
6	DECK JOINT L2X2X3/4" (W/ANCHORS @ 1'O.C.)	460.0	LF	12.00	$5,520
7	REIN. CONC.DECK				
	a) DIAPHRAMS	12.0	CY	450.00	$5,400
	a) SLAB	189.0	CY	200.00	$37,800
	b) WALL	108.0	CY	450.00	$48,600
	c) SIDEWALK	102.0	CY	120.00	$12,240
	d) NEW CONC. ANCHOR BEAM	95.0	CY	450.00	$42,750
	e) COLUMN @ ANCHOR BEAM	1.0	CY	450.00	$450
8	16"sq PRESTRESS CONC. PILE	4,140.0	LF	20.00	$82,800
9	3-BULB WATERSTOP(12-ANG)	375.0	LF	10.00	$3,750
10	L-TYPE WATERSTOP	172.0	LF	30.00	$5,160
11	L-TYPE W-S CRS HARDWARE	172.0	LF	30.00	$5,160
12	JOINT MATERAL	466.0	SF	2.00	$932
13	WALL RUSTIFICATION	1,560.0	SF	27.00	$42,120
14	RELOCATIONS		LS	55,600.00	$55,600
		30		TOTAL	$531,874

LAKE PONTCHARTRAIN ORLEANS OUTFALL CANAL
PHASE I & PHASE II (NOTED BY AN *)

Item	Description	Amount
28	BRIDGE ROLLER GATES	$729,425
29	OMITTED	
30	OMITTED	
1	HARRISON AVE. TIE-IN STA. 36+14.85 TO STA. 37+14.85	$32,483
2	FILMORE AVE. TIE-IN STA. 63+77.7 TO STA. 64+51.7	$26,982
3	ROBERT E LEE TIE-IN STA. 90+22.25 TO STA. 91+21.25	$54,307
4	REACH W-6 I-WALL STA. 91+15.16 TO STA. 91+82	$30,354
5	REACH W-6 I-WALL STA. 91+82 TO STA. 118+87	$715,360
6	REACH W-7 I-WALL STA. 118+87 TO STA. 124+87	$215,751
7	REACH E-6 I WALL STA. 91+21.25 TO STA. 91+84.58	$50,275
8	REACH E-6 I-WALL STA. 91+84.58 TO STA. 118+67	$963,748
9	REACH E-7 I-WALL STA. 118+67 TO STA. 124+67	$242,822
10	REACH E-7 I-WALL STA. 124+67 TO STA. 128+67	$173,743
11	* REACH E-1 I-WALL STA. 2+42 TO STA. 3+65	$49,869
12	* REACH E-1 I-WALL STA. 3+65 TO STA. 36+14.85	$883,829
13	* REACH E-2 I-WALL 37+14.85 TO 44+04 & 44+74 TO 50+00	$425,546
14	* REACH E-3 I-WALL STA. 50+00 TO STA. 63+77.7	$557,711
15	* REACH E-4 I-WALL STA. 64+51.7 TO STA. 90+22.25	$1,306,412
16	* REACH W-1 I-WALL STA. 2+40 TO STA. 3+62	$112,317
17	* REACH W-1 I-WALL STA. 3+62 TO 22+80 & 23+40 TO 29+40	$1,795,254
18	* REACH E-2 T-WALL STA. 44+04 TO STA. 44+74	$64,119
19	* REACH W-1 T-WALL STA. 22+80 TO STA. 23+40	$107,785
20	* R W-2 T-WALL STA 29+40 - 36+28.35 & 37+00.35 + 50+00	$4,147,959
21	* REACH W-4 T-WALL STA. 50+00 TO SAT. 63+76.76	$5,404,370
22	* REACH W-5 T-WALL STA. 64+54.7 TO SAT. 90+14.66	$2,187,785
23	PUMPING STATION T-WALL TIE-IN	$100,709
	MAY. '88 COST SUBTOTAL	$20,378,913

LAKE PONTCHARTRAIN ORLEANS OUTFALL CANAL
PHASE I & PHASE II (NOTED BY AN *)

Item	Description	Amount
	SUBTOTAL	$20,378,913
24	MOB & DEMOB	$60,000
23	ENVIROMENTAL PROTECTION	$20,000
26	PUMPING STATION MODIFICATION	$170,530
27	PUMPING STATION COFFERDAM	$258,500
31	UTILITY RELOCATIONS :	
	a) 30"DIA. WATERLINE AT STA. 44+50 ; $5000/SIDE	$10,000
	b) O.H. POWERLINES AT STA. 4+50,37+20,50+50 ; $3450 EA.	$10,000
	SUBTOTAL	$20,907,943
	25% CONTINGENCIES	$5,192,057
	TOTAL CONSTRUCTION (R)	$26,100,000
	ENGINEERING & DESIGN 12%	$3,100,000
	SUPERVISION & ADMIN. 10%	$2,900,000
	OCT. '87 COST — TOTAL COST	$32,100,000

COST ESTIMATE		LAKE PONTCHARTRAIN ORLEANS OUTFALL CANAL			
Item	Description	Quantity	Unit	Unit Price	Amount
	BRIDGE ROLLER GATES				
1	PZ-22 STEEL SHEET PILE	9,262.0	SF	12.50	$115,775
2	REINF. CONC.				
	a) STEM	191.0	CY	400.00	$76,400
	b) COLUMN	63.0	CY	500.00	$31,500
	c) SLAB	608.0	CY	200.00	$121,600
	d) STABLIZATION SLAB	77.0	CY	70.00	$5,390
3	STEEL GATES	11,600.0	LB	1.50	$17,400
4	HARDWARE	6,200.0	LB	1.50	$9,300
5	ROAD WORK				
	a) SUBBASE	668.0	CY	20.00	$13,360
	b) ROAD SURFACE	3,520.0	SF	10.00	$35,200
	c) REINF. CONC. SIDEWALK	27.0	CY	300.00	$8,100
6	12"sq. PRESTRESS CONC. PILE	16,300.0	LF	18.00	$293,400
7	REMOVE EXISTING RD. SURFACE		LS	2,000.00	$2,000
				TOTAL	$729,425

IDENTIFICATION
NUMBER 80616

REAL ESTATE COST ESTIMATE
LAKE PONTCHARTRAIN AND VICINITY
HURRICANE PROTECTION PROJECT
ORLEANS PARISH OUTFALL CANAL
ORLEANS PARISH, LOUISIANA

ESTIMATE OF COSTS (Date of Value June 1988)

		Acres	Unit Value	Total Value
(a)	Lands & Damages			
	Perpetual Levee Right-of-Way			
	Recreational Land	13.18	$435,600	$5,741,208
	Potential Residential	2.67	653,400	1,744,578
	Improvements			0
	Severance Damage			0
	Total (R)			$7,486,000
(b)	Contingencies 25% (R)			1,872,000
(c)	Acquisition Costs (Estimated 3 tracts)			
	Non-Federal 3 @ $1,400 per tract			4,000
	Federal			5,000
(d)	PL 91-646			0
(e)	Total Estimated Real Estate Cost			$9,367,000

This estimate is based on maps and acreage calculations as provided by CELMN-ED-SP.

Barnie L. McDonald
BARNIE L. McDONALD
Appraiser
16 June 1988

APPROVED BY:

Joseph G. Kopec
JOSEPH G. KOPEC
Review Appraiser
16 June 1988

June 88

COST ESTIMATE	ORLEANS AVE. OUT. CANAL-SECTOR GATES				
Item	Description	Quantity	Unit	Unit Price	Amount
A	***CONTROL STRUCTURE***				
	Embankment-semicompacted	3,000.0	CY	13.00	$39,000
	Structural Excavation	1,250.0	CY	9.00	$11,250
	Structural Backfill	625.0	CY	13.00	$8,125
	PMA-22 Steel Sheet piling (128' X 15')	9,200.0	SF	10.00	$92,000
	HP 14X73 Steel H Piles	13,280.0	LF	24.00	$318,720
	Concrete Stab. Slab, 4"	69.0	CY	100.00	$6,900
	Reinf. Concrete, Base Slab	5,550.0	CY	200.00	$1,110,000
	Wall	4,400.0	CY	350.00	$1,540,000
	Needle Girder and Support	LS	LS	80,000.00	$80,000
	Concrete Needles	LS	LS	180,000.00	$180,000
	SUBTOTAL-CONTROL STRUCTURE				$3,385,995
	STEEL SECTOR GATES (4)				
B	Structural Steel	379,800.0	LB	1.50	$569,700
	Electrical	LS	LS	300,000.00	$300,000
	Mechanical	LS	LS	300,000.00	$300,000
	Control Houses	LS	LS	100,000.00	$100,000
	SUBTOTAL-BUTTERFLY GATES				$1,269,700
	APPROACH GUIDEWALLS				
C	PZ-35 Steel Sheet Piling 200' X 40'	8,000.0	SF	16.50	$132,000
	Concrete Cap, 2' X 6'	90.0	CY	350.00	$31,500
	SUBTOTAL-APPROACH GUIDEWALL				$163,500
D	***EROSION PROTECTION***				
	Shell, 6" Thick	160.0	CY	18.00	$2,880
	Riprap, 12"	975.0	TON	20.00	$19,500
	SUBTOTAL-EROSION PROTECTION				$22,380
	PAGE 1 JUNE'88 COST	SUBTOTAL-A+B+C+D			$4,841,575

COST ESTIMATE		ORLEANS AVE. OUT. CANAL-SECTOR GATES			
Item	Description	Quantity	Unit	Unit Price	Amount
E	***COFFERDAM***				
	Pz-27 Steel Sheet Piling 51' X 880'	44,880.0	SF	12.50	$561,000
	14" Steel H-Piling(HP14X73) 90 X 160'	14,400.0	LF	24.00	$345,600
	18" Waler, W18X76	880.0	LF	35.00	$30,800
	Removal of Cofferdam	LS	LS	150,000.00	$150,000
	Dewatering	LS	LS	465,400.00	$465,400
	Pile Test	2	EA	20,000.00	$40,000
	SUBTOTAL-COFFERDAM				$1,592,800
F	***CHANNEL CLOSURE***				
	Shell Fill, 180' X 54	9,720.0	CY	18.00	$174,960
	PZ-35 Steel Sheet Piling 207' X 33.5'	6,940.0	SF	16.50	$114,510
	Concrete Cap, 2'X 9'X 207'	138.0	CY	350.00	$48,300
	Riprap(Lakeside only)	460.0	TON	20.00	$9,200
	SUBTOTAL-CHANNEL CLOUSURE				$346,970
G	***CHANNEL EXCAVATION***	36,000.0	CY	9.00	$324,000
H	**CHANNEL RETAINING WALL**				
	PZ-35 Steel Sheet Piling	35,000.0	S.F.	16.50	$577,500
	Wall Removal	LS	LS	100,000.00	$100,000
	Structural Steel(Tie-Back System,Furnish-Install Remove)	63,600.0	LB	1.00	$63,600
	Slavage Sheet Piling	598.0	TON	-40.00	$-23,920
	Salvage Misc. Steel	32.0	TON	-25.00	$-800
	SUBTOTAL-RETAINING WALL				$716,380
I	***LEVEE AND FLOODWALL***				
	PSA-23 Steel Sheet Piling	480.0	SF	16.00	$7,680
	PZ-35 Steel Sheet Piling	2,670.0	SF	16.50	$44,055
	PZ-27 Steel Sheet Piling	69,600.0	SF	12.50	$870,000
	Semi-compacted Fill	3,200.0	CY	13.00	$41,600
	Fully-compacted Fill	600.0	CY	16.00	$9,600
	Sand Fill	800.0	CY	16.00	$12,800
	Concrete Cap	2,300.0	CY	350.00	$805,000
	Clearing and Grubbing	8.0	AC	200.00	$1,600
	Fertilizing and Seeding	8.0	AC	500.00	$4,000
	SUBTOTAL-LEVEE & FLOODWALL				$1,796,335
	PAGE 2 JUNE '88 COST	SUBTOTAL-E+F+G+H+I			$4,776,485

COST ESTIMATE		ORLEANS AVE. OUT. CANAL-SECTOR GATES			
Item	Description	Quantity	Unit	Unit Price	Amount
J	**ENVIROMENTAL PROTECTION**	LS	LS	5,000.00	$5,000
K	***MOB & DEMOB***	LS	LS	50,000.00	$50,000
	SUBTOTAL CONSTRUCTION COST				$9,673,060
	CONTINGENCIES 25 % ±				$2,418,265
	TOTAL CONSTRUCTION COST				$12,091,325
	E & D 12% ±				$1,450,959
	SUBTOTAL				$13,542,284
	S & A 10% ±				$1,354,228
	SUBTOTAL				$14,896,512
	****************************				************
	TOTAL				$14,900,000
	PAGE 3 JUNE'88 COST				

June 88

COST ESTIMATE ORLEANS AVE. OUT. CANAL-VERTICAL LIFT GATES

Item	Description	Quantity	Unit	Unit Price	Amount
A	***CONTROL STRUCTURE***				
	Embankment-semicompacted	3,000.0	CY	13.00	$39,000
	Structural Excavation	26,000.0	CY	9.00	$234,000
	Structural Backfill	720.0	CY	13.00	$9,360
	PMA-22 Steel Sheet piling (128' X 15')	1,920.0	SF	10.00	$19,200
	14" X 14" Concrete Piling (444 X 50')	22,200.0	LF	20.00	$444,000
	Concrete Stab. Slab, 4"	51.0	CY	100.00	$5,100
	Reinf. Concrete, Base Slab	529.0	CY	200.00	$105,800
	Wall	678.0	CY	350.00	$237,300
	Machinery House	275.0	CY	400.00	$110,000
	Needle Girder and Support	LS	LS	20,000.00	$20,000
	Concrete Needles	LS	LS	60,000.00	$60,000
	SUBTOTAL-CONTROL STRUCTURE				$1,283,760
B	*VERTICAL LIFT GATES (4)*				
	Structural Steel	110,000.0	LB	1.50	$165,000
	Electrical	LS	LS	300,000.00	$300,000
	Mechanical	LS	LS	300,000.00	$300,000
	SUBTOTAL-VERTICAL LIFT GATE				$765,000
C	***CONCRETE APRONS***				
	12" Dia., Untreated Timber Piles, 220 X 25'	5,500.0	LF	9.00	$49,500
	PMA-22 Steel Sheet Piling 256' X 12'	3,072.0	SF	10.00	$30,720
	Concrete Stab. Slab, 4"	80.0	CY	100.00	$8,000
	Reinf. Concrete, Base Slab	600.0	CY	200.00	$120,000
	Walls	228.0	CY	350.00	$79,800
	SUBTOTAL-CONCRETE APRONS				$288,020
D	***APPROACH GUIDEWALLS***				
	PZ-35 Steel Sheet Piling 200' X 40'	8,000.0	SF	16.50	$132,000
	Concrete Cap, 2' X 6'	90.0	CY	350.00	$31,500
	SUBTOTAL-APPROACH GUIDEWALL				$163,500
	PAGE 1 JUNE'88 COST	SUBTOTAL-A+B+C+D			$2,500,280

COST ESTIMATE ORLEANS AVE. OUT. CANAL-VERTICAL LIFT GATES					
Item	Description	Quantity	Unit	Unit Price	Amount
E	***EROSION PROTECTION***				
	Shell, 6" Thick	50.0	CY	18.00	$900
	Riprap, 12"	150.0	TON	20.00	$3,000
	SUBTOTAL-EROSION PROTECTION				$3,900
F	***COFFERDAM***				
	Pz-27 Steel Sheet Piling 51' X 590'	30,090.0	SF	12.50	$376,125
	14" Steel H-Piling(HP14X73) 60 X 160'	9,600.0	LF	24.00	$230,400
	18" Waler, W18X76	590.0	LF	35.00	$20,650
	Removal of Cofferdam	LS	LS	100,000.00	$100,000
	Dewatering	LS	LS	300,000.00	$300,000
	Pile Test	2	EA	20,000.00	$40,000
	SUBTOTAL-COFFERDAM				$1,067,175
G	***CHANNEL CLOSURE***				
	Shell Fill, 180' X 54	9,720.0	CY	18.00	$174,960
	PZ-35 Steel Sheet Piling 207' X 33.5'	6,940.0	SF	16.50	$114,510
	Concrete Cap, 2'X 9'X 207'	138.0	CY	350.00	$48,300
	Riprap(Lakeside only)	460.0	TON	20.00	$9,200
	SUBTOTAL-CHANNEL CLOUSURE				$346,970
H	***CHANNEL EXCAVATION***	30,000.0	CY	9.00	$270,000
I	***LEVEE AND FLOODWALL***				
	PSA-23 Steel Sheet Piling	480.0	SF	16.00	$7,680
	PZ-35 Steel Sheet Piling	2,670.0	SF	16.50	$44,055
	PZ-27 Steel Sheet Piling	69,600.0	SF	12.50	$870,000
	Semi-compacted Fill	3,200.0	CY	13.00	$41,600
	Fully-compacted Fill	600.0	CY	16.00	$9,600
	Sand Fill	800.0	CY	16.00	$12,800
	Concrete Cap	2,300.0	CY	350.00	$805,000
	Clearing and Grubbing	8.0	AC	200.00	$1,600
	Fertilizing and Seeding	8.0	AC	500.00	$4,000
	SUBTOTAL-LEVEE & FLOODWALL				$1,796,335
	PAGE 2 JUNE'88 COST	SUBTOTAL-E+F+G+H+I			$3,484,380

Item	Description	Quantity	Unit	Unit Price	Amount
J	**ENVIROMENTAL PROTECTION**	LS	LS	5,000.00	$5,000
K	***MOB & DEMOB***	LS	LS	50,000.00	$50,000
	SUBTOTAL CONSTRUCTION COST				$6,039,660
	CONTINGENCIES 25 % ±				$1,509,915
	TOTAL CONSTRUCTION COST				$7,549,575
	E & D 12% ±				$905,949
	SUBTOTAL				$8,455,524
	S & A 10% ±				$845,552
	SUBTOTAL				$9,301,076
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	TOTAL				$9,300,000